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The Ransom Siphon Condenser.

The accompanying engraving represents Ransom's siphon condenser, as it has been in use in the Buffalo City Flouring Mills, the past year, in connection with an engine, cylinder 18 inches diameter, 36 inches stroke, making 100 revolutions per minute, with 50 pounds steam boiler pressure. It is the invention of Franklin Ransom ,who has been several years engaged in perfecting it. It is intended to perform the service and duty of the air pump in perfecting and maintaining a vacuum which it is claimed it does in a cheaper, easier, and simpler manner, and at a much reduced cost of construction and expenditure of power, besides which, it can be operated by any one who can run a high pressure engine.

In the accompanying engraving A represents the steam exhaust pipe from the engine carrying the steam to the condenser, B, which is placed at the hight of 32 feet above the water in the overflow. C is the water injection pipe, connected with a pump, G, of ordinary construction, which is fed from a well, D, or, in case of a natural head of water, the pump can be dispensed with. The condenser, B, is provided with a perforated plate upon which the injection water is thrown, and under which the steam is admitted. To the bottom of the condenser are attached the outlet pipes, E, through which the water, injected by the pipe, C, and resulting from the condensation of the steam, flows out and is discharged from the reservoir and overflow, F. It will be observed that advantage is taken of siphonic action set in motion by the water pump, G, and afterwards maintained by it and the action of the vacuum.

When the engine is started, the exhaust steam passes into the condenser under the perforated plate, and at the same time the pump throws water upon it. the steam the ing condensed, a partial vacuum is formed, and after a few strokes it becomes more and more perfect, the labor of the pump decreasing in proportion as the vacuum increases until it reaches the minimum. The water injected and from the condensed steam, falls through the condenser, enters the outlet pipes, and as it passes out carries the air and any incondensable gas with it ; thus by the action of the siphon keeping up the circulation and maintaining the vacuum. It has also been found that where an independent pump is used, as is preferred on large engines, the vacuum will be perfected and maintained by the siphonic action alone without the steam.

With a vacuum of 13 pounds per square inch and the condenser at the hight of 32 feet, the water will stand in both legs of the siphon 29 feet, and it will then require the labor of the pump to lift the water 3 feet, for at that point it will be taken by the vacuum and passed into the condenser, and out of it by the long leg of the siphon. In actual practice on an engine where the water has been lifted 12 feet at a cost of one third of 1-horse power, the vacuum has been equal to 24-horse power. Thus only about one third of one per cent of the power gained is used in lifting the water.

It will be seen that this condenser costs much less than the usual air pump and condenser, and that it weighs much less, a fact of great value on marine engines ; also, that it is less liable to derangement, and that it will admit muddy water, which allows its use on our western rivers, where the mud and sand soon destroy the usual vacuum apparatus. It is also applicable to all engines now in use requiring no change in them, or in feed water heaters, or in cut-offs ; and first-class, high-pressure engines with this condenser will show a better result than any engine using the air pump.

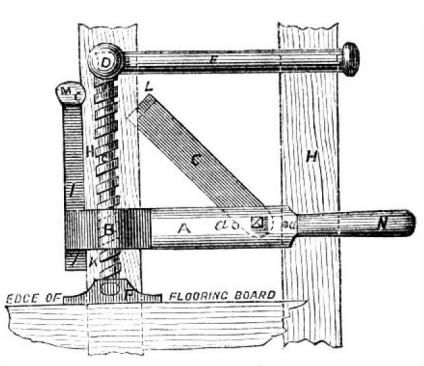
For vacuum sugar pans, surface condensers, and oil still condensers, it is equally applicable, as the water now used in condensing will also maintain the vacuum and condense the vapor. In oil stills the vapor can be admitted directly into the condenser, the oil separating easily by gravity from the water. Certificates have been shown us from several well known firms in Buffalo showing the gain to have been from 25 to 42 per cent of the fuel formerly used.

The invention is secured by letters patent, which have been assigned to the Ransom Siphon Condenser Co.—J. L. Alberger, Treasurer—at Buffalo, N. Y., to whom application for licenses or further information can be made.

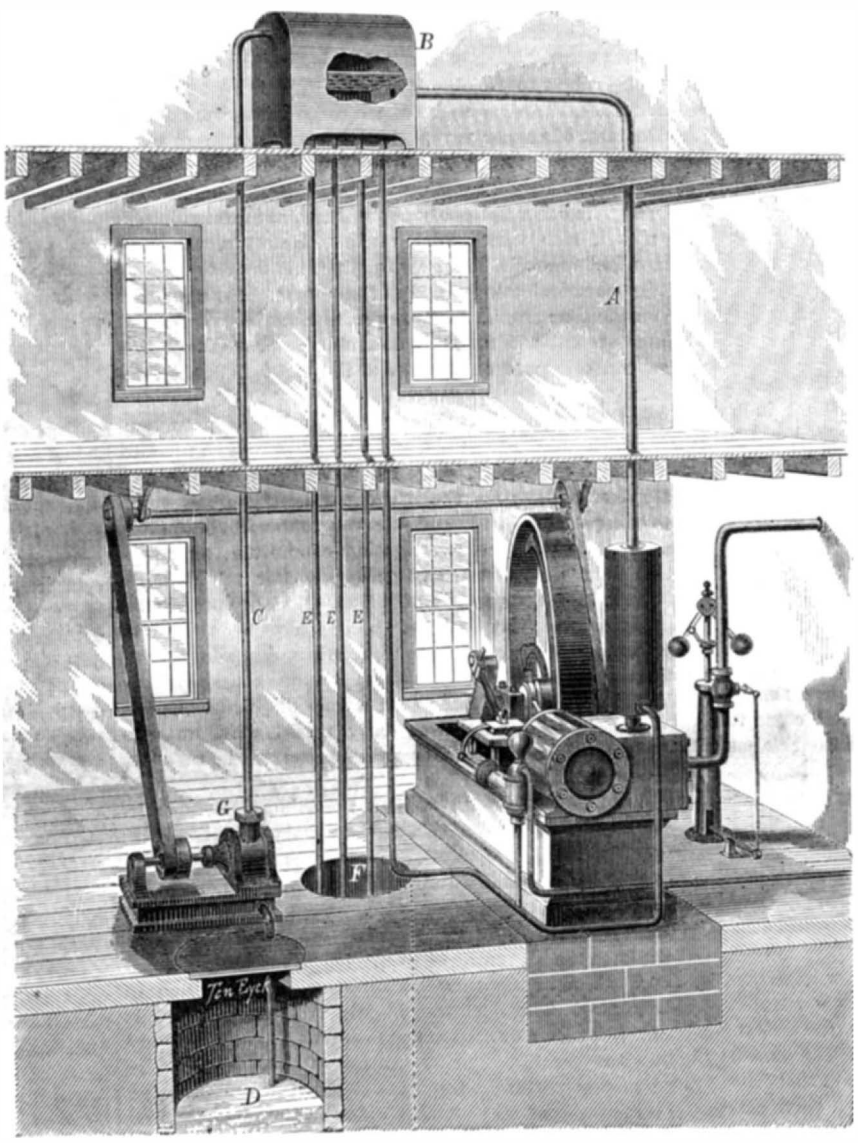
6,900 workmen at the iron and steel works of Krupp, in Germany, produced 125,000,000 lbs. of steel last year.

FLOORING CLAMP.

A very handy flooring clamp, an English device—applicable moreover to other purposes—is here illustrated. It is composed of a metal plate, A, having a boss, B, pierced with a slightly inclined screw-tapped hole, through which passes a screw C, the head of which is perforated at D to receive the end of a lever, E, and the opposite end socketed in a foot plate, F. The metal plate traversed by the screw also carries a gripping lever, G, bolted loosely on its under side, the plate being pierced with several holes, *a a*, so that the pivoting of the gripper may be shifted at pleasure. The action is as follows : The plate is laid flat on the joists H H, so that the gripper, G, lies between the joists, the end coming against the joist, and the foot-plate, F, against the edge of the outer flooring board. The clamp being in this position the screw, C, is turned by the lever, E, so that the foot plate begins to press against the edge of the flooring board, and the main plate, A, to recede from it ; this backward motion of the plate,



A, along the screw, C, causes the end of the gripper, G, to nip against the side of the joist, H, forming a bearing which becomes firmer the more the screw, C, is turned in the same direction and the greater the pressure brought on the flooring. By turning the screw in the opposite direction the plate, A, advances along the screw, the pressure is taken off the edge of the flooring board, and the clamp may be immediately removed by unscrewing about two inches and striking a blow with the hammer, at M. It may also be used as a lifting jack and as a carpenter's bench clamp.



THE RANSOM SIPHON CONDENSER.

Stump Drawing by Steam.

In the neighborhood of Tattershall, in Lincolnshire, are some hundreds of acres of waste land, of a light, sandy, and gravelly nature, incumbered by the stumps of Scotch fir trees cut down some years ago, and only growing wild grass and ling. It has been proved, however, by experiments made in a small way, that this land, if properly cleared, drained, and clayed, is capable of bearing good root crops; but, until lately, the great expenditure of labor incidental to extracting the stumps and roots of the fir trees has prevented the work of reclamation from being carried out to any great extent. A short time ago, however, Mr. John Robert Bankes, the agent and steward to Lord Fortescue, to whom the land belongs, determined to attempt drawing the stumps by means of steam plowing engines, and, eventually, after a consultation on the subject with Mr. Toepffer, of the North Lincolnshire Steam Cultivating Co., a contract was entered into by this company to perform the work.

The stumps are from 12 in. to 20 in. in diameter at the base and stand from about 8 ft. to 10 ft. apart, and the operation of drawing them, which has now been going on successfully for some weeks past, is performed as follows : Two of Messrs. John Fowler & Co.'s 20-horse steam plowing engines are placed about 200 yards apart, with a row of the tree stumps between them, and, in commencing, the wire rope from the drum of one engine is led across to the second engine, passed round a snatch block there, and led back and attached to the engine, from the drum of whichit was uncoiled. The snatch block just mentioned is connected by a strong chain to a two-fluked and chor of a form suitable for taking hold of the stumps, and to a chain at the back of the anchor is attached the rope of the second engine. Things being thus arranged, the anchor which is, as it were, suspended between the engines, is raised by four men and placed about 2 ft. in the rear of the first stump to be extracted. The engine connected with the snatch block is then made to haul upon its rope when the anchor is drawn into the ground, takes hold of the stump, and extracts it with the utmost ease. As soon as the root is clearly pulled up, the second engine hauls back the anchor to clear it, and all is then ready for acting on another stump. When fairly at work, the drawing of the stumps is performed at the rate of one per minute.

The pull which each engine is capable of exerting on the rope is about 8 tuns, so that by the aid of a single snatch block a pull of 16 tuns can be exerted, or by means of a double snatch block, a pull of over 30 tuns. The double snatch block, however, is only required for the largest stumps. Besides the two 20-horse engines, two others, of less power, are engaged in drawing the extracted stumps into heaps, and thus clearing the land for plowing. The whole operation has, as we have said, been thoroughly successful, and all parties concerned are to be congratulated on opening up a new and useful field for the employment of steam plowing engines.—*Engineering.*

NEW APPLICATIONS OF BARYTA.—The sulphate of baryta is said to possess many advantages over lime as a material for whitewashing walls—4 ozs. of glue is soaked for twelve hours in tepid water, and then placed until it boils, in a tin vessel, with a quart of water—the vessel being placed in water, as in the usual process of melting glue ; the whole is then stirred until dissolved. Six or eight pounds of sulphate of baryta, reduced to an impalpable powder, is put into another vessel ; hot water is added, and the whole stirred until it has the appearance of milk of lime. The sizing is then added, and the whole stirred well together, and applied in the ordinary way while still warm.

VERY valuable mines of silver, lead, antimony, zinc-blende, copper, and gold, have lately been discovered in the Himalayas. One mine at Shigri, on the old boundary of Northern India, is described as an enormous lode, in which the ore is several feet thick and solid. The others are principally in the Vazeeri Rupi (the silver country of the Vazeers)—a name it was long known by, being so described in the maps as part of Kirloo.

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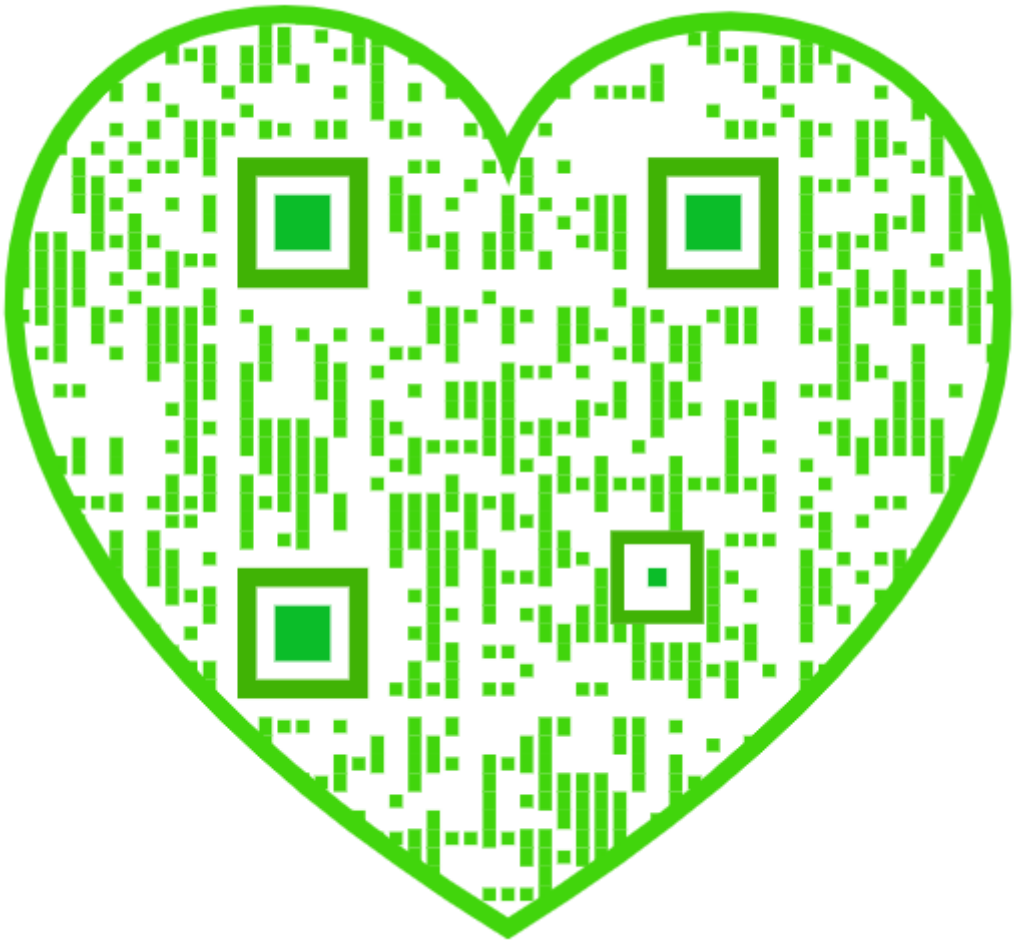

LAPIDARY WORK.

Translated from the French.

There were, in 1860, 146 establishments engaged in this branch of industry in Paris, of which 5 employed over 10 hands, 39 from two to ten, and 102 but one each. The total number of hands employed was 317, there being 148 men paid by the day, and 105 by the piece; 6 women paid by the day, and 58 apprentices, who were boys under sixteen years of age. The total value of the annual production was 3,849,120 frs.

The lapidary's art is very ancient, but the method of cutting diamonds with their own dust was scarcely known before the thirteenth or fourteenth century. This discovery has for a long time been attributed to Louis de Berquem, of Bruges, who lived in 1746, and it is only within a short time that new researches have proved that the art of cutting diamonds was known before that period. It is known, for instance, that, early in the fifteenth century, princes and lords owned and made presents of diamonds, and that there was in Paris, in 1407, a diamond cutter named Herrmann, who had the reputation of being very skillful in his art. It is proper, also, to add, that the jewelers, in an act of 1739, against lapidaries, quote an ordinance of the Provost of Paris, dated Nov. 18th, 1387, according to which the number of jewelers who devoted themselves particularly to the cutting of diamonds and precious stones was about 15 or 16.

In the Middle Ages, as has been shown, the jewelers alone practiced the cutting of precious stones; this privilege they preserved without opposition until the year 1584, when some of their members associated themselves with the masters of an old society of crystal cutters, founded in the time of St. Louis, and obtained from the former a number of workmen sworn to cut precious stones for them, to the exclusion of all others, even the jewelers themselves.

Dissentions immediately sprang up between the lapidaries and the jewelers. The former, not being satisfied with the power which they had obtained, began to encroach on the privileges reserved to the jewelers; while the latter continued to practice gem cutting, while awaiting the final judgment of the trial pending before the Parliament. Finally, on the 6th of September, 1631, the court rendered a decision by which the lapidaries were maintained in the sole right to cut all kinds of precious stones, and to work in pearl and crystal, but they were expressly forbidden to set the stones in gold or silver. Two decrees, one rendered by the Council of State, Jan. 28, 1673, the other by the Parliament, Feb. 9, 1740, prohibited the lapidaries from assuming the rank of merchant jewelers, and from giving to their workmen the title of guards and allowed them only to call themselves master lapidaries, engravers, and workers in all kinds of precious natural stones. In spite of these decisions, the lapidaries did not cease to claim the right to sell mounted gems, and asserted their claims with such persistence that, after the reorganization of the society, in 1776, they were allotted the exclusive right to set artificial stones, and authority to set natural stones conjointly with the manufacturing jewelers.

At the time of the Renaissance, lapidaries often cut precious stones in the form of vases and cups, but their principal work has always been the cutting of precious stones to be set in rings, necklaces, etc.

The art of cutting diamonds has been very slow in attaining perfection. In the fifteenth century, diamonds were table cut, and cut in the form of shields and stars; in the following century, the cutting of rose diamonds was introduced, and it was only under the reign of Louis XIV. that the method of cutting brilliants was discovered; the twelve diamonds to which Cardinal Mazarin has left his name were the first in France that were cut in this way.

During the latter part of the eighteenth century, diamond cutting was practiced on a great scale in the city of Amsterdam, and the minister Calonne, wishing to establish a diamond-cutting establishment in the Faubourg Saint Antoine, was obliged to call a master and some workmen from Holland. The Revolution finally dispersed the Parisian lapidaries, and, since that time, Amsterdam has exclusively practiced the art of cutting diamonds.

The work of cutting is performed in the same way as in former times, the only modifications in the art arise from the substitution of steam engines for the old motors. The cutting of diamonds is divided into three operations: the cleavage, which is designed to remove the defective parts of the stone, consists in breaking the diamond by means of the blade of a chisel placed in a groove made with another diamond; the blocking out or reducing it to its first rough form, which is done by rubbing together two diamonds fixed by means of mastic to the ends of two wooden handles; and finally the polishing, by means of which the diamond receives its smooth and brilliant surface and its regular facets, which is done on a horizontal wheel covered with diamond dust soaked with olive oil. The workman fastens the diamond to the end of the cement rod by pouring lead around it and then applies it to the mill. He is the sole judge of the best form to be given to the diamond, and has no guide but his own experience.

Formerly, the cutting of diamonds caused a loss of from 50 to 60 per cent of their weight, but by the present methods of cutting, the loss is not more than from 40 to 50 per cent. The diamonds do not appear as well, but as they are sold by weight the merchant obtains a better price.

Diamond lapidaries cut diamonds only. The other precious stones, such as rubies, emeralds, sapphires, topazes, amethysts, garnets, etc., are cut, in Paris, by special workmen, who also cut jasper, onyx, agate, cornelian, turquoise, etc.; still, merchants, when they have large quantities of stone to cut, apply to the lapidaries in the Jura, and even to those of Germany and Switzerland, where hand labor is much cheaper than in Paris.

Hard stones are cut in the same style as diamonds, and are polished with tripoli and water. The hardest are cut with emery on lead wheels, or with tripoli on wooden wheels.

The average wages received by the hands employed in this branch were: men, 6·37 fr.; women, 2·54 fr.; and apprentices receiving pay, 1·5 fr.

The amount exported was 257,000 fr., of which 48,000 was to America, 35,000 to England, and 30,000 to Russia.—*Industrial American.*

HOW TO OBTAIN A FINE PATINA ON BRONZE STATUES.

Translated for the Scientific American from the Polytechnic Journal.

It has been experienced in most large cities, especially in those where mineral coal is used as fuel, that bronze statues erected in public places do not obtain a fine patina, but become dark-colored and unsightly. The desire to find a means for obviating this, induced the Berlin Society for the Promotion of Industry to make careful experiments on this subject. The first question to be answered was this: Does the existence of a patina depend on the chemical composition of the bronze? To decide this query, samples were taken from ten different bronze statues, all of which were covered with a beautiful patina. Each of these samples was analyzed simultaneously, by two reliable chemists. The results obtained showed these bronzes to be of very different composition The amount of copper varied from 77 to 94 per cent. One sample contained as much as 9 per cent of tin, others 4 per cent, and some only 0·8 per cent of tin, but up to 19 per cent of zinc. The other accessory ingredients, such as lead, iron, and nickel, also varied very much. However, all these bronzes had formed a fine green patina. It is quite possible that the chemical composition of the bronzes has some influence on the time required for the production of a patina. But the above-mentioned analyses undoubtedly prove that a fine patina can originate on bronzes of the most different composition.

It has been noticed that those parts of public bronze monuments which were accessible, and which were often touched by the hands of visitors, were covered with a fine, though not a green patina; all the other parts of the same monuments being dark-colored, and of a very unfavorable appearance. This fact led the investigating committee to the supposition that the presence of greasy matter might be of importance in the formation of patina. Some experimental bronze busts were therefore set up in such parts of the city where impure exhalations are frequent, and where several public statues previously erected had assumed a dirty-looking black color, without forming even a trace of patina. One of these experimental busts was daily rinsed with water to keep it clean, and was besides painted over with neat's-foot oil once a month; the oil being put on by means of a brush, and rubbed off again with woolen rags immediately after. Another bust was rinsed with water every day like the first; but was not treated with oil. A third was also rinsed with water daily, and treated with oil twice a year. A fourth was set up and left entirely untouched.

The 1st and the 4th of these busts were put up in 1864, the 2d and the 3d in the beginning of 1866. They have fully verified the supposition of the committee regarding the action of greasy matter. The bust treated with oil once a month is now covered with a dark-green patina, which is declared very fine by all art critics. The one treated with oil twice a year has a less fine patina; while that cleaned only with water, presents nothing of that peculiarly fine appearance produced by the formation of patina. The bust which was not cleaned at all looks black and dull, making a highly disagreeable impression on the observer.

It may be safely inferred from these experiments that a bronze monument erected in a public place can be made to obtain a fine patina, if the bronze is kept clean and rubbed with oil once a month. If the frequency of this operation can be reduced, and to what extent, can only be decided by future experiments. The operation presents some practical difficulties with many large monuments.

The committee has put up two more bronze busts which had been artificially patinated by chemicals; and it now remains to be seen how these will stand, when subjected to similar treatment. It has not as yet been explained in what way the oil takes part in or influences the formation of the patina. So much, however, has been ascertained that any surplus of oil has to be avoided, and that all the oil that has been put on, must at once be removed as carefully and as completely as possible. If any oil remains on the bronze, it makes the dirt stick to it, and gives it an unclean appearance. It cannot be supposed that the remaining small quantity of oil would form a chemical combination with the layer of oxide on the bronze, especially because neat's-foot oil, as well as olive oil, has been found to be equally adapted for the purpose. It seems more probable that the oil, by forming a thin layer over the bronze, prevents any moisture from settling on it. This moisture, if not kept off, would cause the dust to adhere, would absorb gases and vapors, and would favor the growth of a vegetation of microscopic plants, by which the appearance of the surface of the metal would inevitably be slighted. However this may be, it is an established fact that grease is an important agent in the formation of patina. It is to be expected that the treatment with oil will also be advantageous in another respect. It has been noticed that bronzes which are covered by a fine patina get a white, opaque, chalk-like surface in those places over which the rain-water is chiefly running. A proper treatment with oil will doubtless prevent this. At any rate it may be expected that through the use of oils, finely patinated bronze monuments will in future be seen in large cities where mineral coal is used as fuel, and that these monuments will not appear light-green, but dark, perhaps even black, but they will have the peculiar luster and other fine qualities of patina. S.

SCIENTIFIC INTELLIGENCE.

BISMUTH.—The increased demand for this metal has occasioned the examination of new localities, and the search has, in several instances, been attended with success. A remarkably pure ore has been found in Peru, which, on analysis, gave: Bismuth, 93·372; antimony (with trace of tin), 4·570; copper (with a little iron), 2·058—total, 100. The absence of arsenic and sulphur is noteworthy, and distinguishes this ore from the Saxon variety. Also, in South Australia, seams of bismuth have been found associated with copper.

NAPHTHALIN RED.—This coloring matter is called in England, "Magdala Red," in honor of Lord Napier, the hero of Abyssinia, in imitation of the French names of Magenta and Solferino for aniline colors. It is prepared by the action of nitrous acid on naphthylamin, and is manufactured in large quantities in France and England. It is a dark brown powder, soluble with deep red color in boiling alcohol; only slightly soluble in cold water, but largely in hot water; not soluble in ether. The solution in alcohol is highly fluorescent, which reaction affords, according to Hoffman, a method for distinguishing it from aniline red. In depth of color it is said to be equal to aniline, while it is superior to that dye in permanency; but it loses luster on dark tints, and hence its use is limited to light shades.

ARTIFICIAL ALIZARIN.—At a recent meeting of the Chemical Society of Berlin, Messrs. Graebe and Liebermann made the interesting communication that they had succeeded in preparing artificially the beautiful red principle of madder from anthracen, one of the waste products of the distillation of coal oil. They exhibited specimens of the color and some cloths dyed with it. The process of the manufacture is not divulged; but if it proves to be practicable it will be one of the most important contributions yet made by organic chemistry.

RECENT EXPLORATIONS OF DEEP-SEA FAUNA.—In the January number of the *American Journal of Science and Arts*, Professor A. E. Verrill gives an interesting summary of recent investigations on life at great depths. The first observations were made by Dr. Wallich, in 1860, when worms, crustacea, bryozoa, and echinoderms were found at depths varying from 445 to 1,913 fathoms. This was deeper than life had previously been supposed to be possible. Similar observations were made by Milne Edwards, by the discovery of living mollusca or corals adhering to the telegraph cable between Algiers and Sardinia, when taken up for repairs, on portions that had been sunk to depths of 1,093 to 1,577 fathoms. Later, G. O. Sars found nine fishes living at 200 to 450 fathoms. These discoveries have very important bearings upon geological science and physical geography, as well as geology, and will occasion important changes in many generally accepted theories. The following are some of the results already obtained. (1). Life does not disappear at 300 fathoms, as supposed by Forbes and others, but shallow-water animals are found at much greater depths. (2). It follows that a great abundance of fossils, in a geological formation, is no proof of shallow-water origin. (3). Bright colored animals are also found at great depths, so that this peculiarity cannot be assumed as evidence of shallow-water origin in fossils. (4). Several species of deep-sea crustacea have perfectly developed eyes, which would seem to show that light penetrates to greater depths than is commonly supposed. (5). That the temperature of the water at great depths is not everywhere the same, but is often far below the freezing point, as shown by Carpenter at 700 fathoms. (6). Finally, the investigations throw new light on the manner of the deposition of rocks, and modifies the doctrine of natural selection.

WHAT GEORGE STEPHENSON ACCOMPLISHED.

At the banquet given by the manufacturers of Pittsburgh to the American Railway Master Mechanics' Association on the occasion of its last convention, which was held in that city, Hon. J. Tyng Brooks, in response to the toast, "George Stephenson, the Great Master Mechanic," made an eloquent speech, from which, as published in the Second Annual Report of the Association we make the following extract:

"How marked is the change in the public sentiment respecting railroads now and forty years ago, when George Stephenson, whose name and deeds we would recall to-night, was reasoning, pleading, coaxing, and fighting, for it took all of these to persuade England into having a railroad. Far different from this scene of splendor which is spread before us to-night were the associations of his early life; no banquets were given to him when he was unfolding the properties of the locomotive and studying how he might make it useful to his fellow-men. Instead of plaudits from the press, encouragement from the Government and men of science, the unlettered Northumbrian miner had to fight his way in the face of them all until he planted his railroad and locomotive in their midst and justly won a place among the benefactors of his race.

"Go to the mining districts of your own State, to the Lehigh valley, the Westmoreland or the Youghiogheny mines, and you cannot find so humble an abode as that in which George Stephenson was born and reared. One single room in a house of four rooms, each occupied by a family, was for years the home of his father, mother, and six brothers and sisters. Away from schools, books, and educated companions, his toil at the mines began when he was big enough to lead a horse, his comrades, the rough uncultivated miners and

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drivers, his leisure time employed in such diversions only as his own ingenuity or fancy could devise. And yet from such a beginning and such surroundings, grew the world-renowned Master Mechanic, the accomplished engineer, the opulent railroad and locomotive builder, the companion of scholars, statesmen, and princes. His life, while full of interest to the casual reader, and especially to those who are interested in the history and progress of railroads, is the most instructive example I could name for those to imitate, who, in youth and poverty, aspire to excellence and fortune. For George Stephenson was not wafted by fortunate winds nor lifted by powerful friends to the eminence he attained. At every step in his inventions he was stubbornly opposed by the ignorant, the selfish, the prejudiced, and sometimes even by the educated, until at length he triumphed over every obstacle, and by his individual exertions raised himself to the proud position he finally occupied. His success was due to patient industry, careful study, frugal habits, and above all a spirit that was ever undaunted and invincible. When quite a boy his enthusiasm was centered on the stationary engine, and hours that were given by his companions to play, he spent in taking the engine to pieces, examining carefully its separate parts, learning the purposes of each, and when at an unusually early age he had mastered its details, he began to suggest and make improvements. Evenings he devoted to make shoe lasts, mending clocks and shoes, and cutting out garments for the miners, and at eighteen years of age he began to learn the mysteries of the alphabet and try to read, write, and cypher. And now behold the work he accomplished and the results he achieved. When he came to the Killingworth mines he found them embarrassed by defective machinery for hoisting, pumping, and ventilating, and the product of the mines was drawn in carts by horses down to the sea. He left them with improved engines, with improved methods of pumping and draining, a safety lamp of his own invention, to protect miners from their stealthy and dreaded foe, fire damp, and two locomotive engines and a railway by which to transport coal to the shipping port. He appeared before societies of learned men, before parliamentary committees, and with earnest Northumbrian dialect asserted the utility of traveling engines and iron tracks.

"And so slow was England to believe him, so blind to the value of railroads that her House of Commons rejected the first bill to allow one to be built, because the proposed route lay through a certain nobleman's fox cover. Even his own friends and supporters were incredulous of the power and speed he predicted of his locomotive, and when he declared it could be made to travel twenty miles an hour, they begged him to speak within bounds, for he would certainly ruin their prospects if he talked of so insane a project as a train moving at twenty miles an hour. And when a new survey was made to avoid the nobleman's hunting ground, when Stephenson's tongue was bridled so that it would speak of eight or nine miles an hour instead of twenty, it still took lawyers, lobbyists, and thousands of pounds sterling to convince the Solons of England that a railroad would be a useful institution. And the bill for the second railroad in England could only be carried through Parliament on condition that the cars should be moved by horses and not by traveling engines. People everywhere cried that railroads would ruin the country. Catholic priests in a neighboring county denounced them as the beginning of the reign of Antichrist. Men claimed that they would destroy canals and stage lines; horses would become worthless; half the men in England would be forced to idleness and poverty; cattle and sheep in pasture would be terrified to death at the sight of a locomotive flying through the air, breathing fire and smoke, and unearthly noises in its mad career; gardens and strawberry patches would be ruthlessly invaded; game preserves would be destroyed; women would be brought to premature confinement, and universal disquiet, disorder, and calamity, would follow the establishment of railroads. Such objections as these were urged sincerely and persistently by all classes of people forty years ago. But when permission was finally given by Parliament to build a railroad, new and more formidable obstacles were encountered. Land owners stood at their boundaries and forbid the engineers to enter and make the surveys, and the latter were forced to all manner of expedients to out-wit them and accomplish their work. They surveyed at meal time when the farmer was at dinner, by moonlight when he was asleep, and on Sunday when he was at church. Sometimes they were mobbed by superior numbers, their instruments smashed to pieces, and their very lives put in jeopardy. But when all these obstacles were surmounted, when the route was surveyed and a track laid, a holiday was appointed by the directors, and a free ride promised to all who should come and be present at the joyful occasion of opening the road. The people came by thousands in Sunday attire from every direction to witness the novel sight. And a novel sight it must have been. The procession was headed by a man on horseback, carrying a flag, behind him stood the low, uncouth little engine, the smoke streaming lazily from its stack, and George Stephenson, with his hand on the lever, waiting for the signal to start. A long train of coal cars was attached, and into them a few—the more courageous of the spectators—ventured, while hundreds upon foot and in vehicles waited in suspense the result of the enterprise. Soon the signal was given, the man on horseback started, waved his flag, the engine began to puff and the train to move, and amid music from the bands and shouts from the multitude that pressed eagerly behind and followed for miles, the procession moved off at about six miles an hour, and the railroad was voted a complete success. From that day George Stephenson's name and fortune were made. A few years passed and he was the proprietor of locomotive works at Newcastle employing nearly a thousand men, and the engineer of thirty different railways. Soon the golden stream, whose current had been against him, turned in his favor, and he became a millionaire. Railway companies voted him medals and placed his bust in their offices and public stations. He was consulted by statesmen and capitalists at home, and became the honored guest of kings abroad.

"He found the locomotive a loose, disjointed machine, running by cog wheels on a tooth track, without symmetry, power, or speed; he left it the grandest production of human skill, a magnificent monster, instinct with life, terrible as a fiend, docile as a lamb, a perfect model of grace, majesty, and power. Forty years ago, his two little engines doing drudgery at the Killingworth mines, were the only locomotives in Europe. To-day more than eight thousand are harnessed to trains of people and freight in Great Britain alone, drawing people by the thousand, and freight by the hundred tun at ten to sixty miles an hour. Then the only use conjectured of railroads was to carry coal and heavy merchandise, and no one but Stephenson believed that passengers would trust themselves behind an explosive machine going at twenty miles an hour. Now more than three hundred and fourteen million passengers are annually carried on the railroads of Great Britain, and find it not only convenient and pleasant, but cheap and safe in the highest degree. For, in England, to-day it is cheaper to ride in cars than to walk, and the victims of lightning and the gallows are far more numerous than those of railroads. Then the Stockton and Darlington Railroad was the only line in Europe upon which engines and cars could be seen moving. To-day the citizens of London can stand at one of the stations on one of the many lines of railway that center in that vast metropolis and count seven hundred trains each day bearing, with mathematical precision and safety, their animate and inanimate burdens. Thus the railroad is no longer a bugbear or chimera, but a living, indispensable reality, and projectors of railroads are not hooted at and mobbed, but rather welcomed as the real promoters of our civilization."

MICROSCOPICAL EXAMINATION OF MILK UNDER CERTAIN CONDITIONS.

READ BEFORE THE MANCHESTER LITERARY AND PHILOSOPHICAL SOCIETY, NOV. 30, 1869, BY J. B. DANCER, F.R.A.S.

In August and September last an account appeared in one of the newspapers (and also in other periodicals), which had been copied from the *Journal des Connaissance Médicales*, of some microscopical observations made by M. V. Essling on milk, in which the author stated that "if the surface of fresh cream be examined under the lens, one perceives, amid myriads of milky and fatty globules, a number of either round or oblong corpuscles, sometimes accompanied with finely-dotted matter, being neither more nor less than germinative masses of vibrios—just what is seen in most substances in a state of putrefaction.

"In summer these corpuscles make their appearance within 15 or 24 hours after milking; in winter they will be perceptible after the lapse of two or three days. If the observation be continued until the moment of coagulation, we see these corpuscles increasing in number, bud, form ramified chains, and at length be transformed into regular mushrooms or filaments composed of cells placed end to end in simple series, and supporting at their extremities a spherical knob filled with granulous matter. M. V. Essling thinks that they may be classified among the Ascophora. But the important point is, that the first appearance of these spores occurs before the milk gets sour, and as this substance is almost the exclusive aliment of children, there is reason to suppose that many of the gastric affections to which they are subject are owing to this state of the milk. To prevent these evil consequences, M. V. Essling recommends the milk to be drunk as soon as possible after extraction, and, at all events, to keep it closely bottled during the interval, so as to keep out the smallest particle of air. Moreover, the temperature should be kept as nearly as possible the same as that which the milk had in the teats."

Having for many years been familiar with the microscopical appearance presented by milk and cream, and not having seen the changes as described by M. V. Essling, I was desirous of satisfying myself on this point, more especially as it affected a very important article of food. The composition of ordinary milk, as stated by Fownes, is as follows:

Water	873·00
Butter	30·00
Casein	48·20
Milk sugar	43·90
Phosphate of lime	2·31
Phosphate of magnesia	0·42
Phosphate of iron	0·07
Chloride of potassium	1·44
Chloride of sodium	0·24
Soda in combination with casein	0·42
	1,000·00

Composition of casein in 100 parts:

Carbon	53·84
Hydrogen	7·15
Nitrogen	15·64
Oxygen } Sulphur }	23·37
	100·00

Composition of albumen in 100 parts:

Carbon	53·5
Hydrogen	7·0
Nitrogen	15·5
Oxygen	22·0
Phosphorus	0·4
Sulphur	1·6
	100·00

Casein and animal albumen are remarkably similar in composition; casein differs in not being coagulated by heat, and is precipitated by acetic acid. Certain animal substances cause its coagulation, such as the dried stomach of the calf, known as rennet, used in the manufacture of cheese.

When a thin film of milk is examined with the microscope, it is found to be a transparent fluid, in which are floating numerous transparent globules of fat; these are surrounded by a thin pellicle, and when this pellicle is broken mechanically, as by churning, the fat is liberated and forms butter. The fluid part consists of casein, saccharine matter, and salts in solution. The proportion of these organic principles varies in different animals, and also in the same animal when fed under different conditions. Human milk usually contains a larger proportion of sugar than cow milk, and is coagulated with greater difficulty. It is well known that the secretion and quality of milk are influenced by the mental emotions.

Milk as obtained in towns is frequently adulterated, and as foreign matter would alter its microscopical characteristics, it was necessary to procure pure milk. One of our members, Mr. Kipping, kindly supplied me with a bottle of fresh-drawn milk. The cow had calved about three months previously, and had been fed on grass, bran, and bean-flour. This milk was examined soon after I received it, and was found to be very rich in oleaginous globules, forming a plentiful supply of cream. There was no appearance of dotted matter or any fungoid growth when examined by powers varying from 200 to 1,500. The smallest oil globules exhibited (as usual) great molecular activity. A bottle was filled with some of this milk and securely corked; other portions of the milk were placed in open cups; one cup was kept in a cabinet which was closed during the day, the milk of the second cup was placed in a closet, the atmosphere of which I knew to be favorable to the growth of fungi, the Mucor Mucedo being the most abundant and of the same family as that mentioned as having been found in cream by M. V. Essling. The milk in the bottle and that in the cups were examined daily, precautions being taken to close the bottle speedily after a portion was removed. On the third day, the milk in the open cups was sour to the smell, but no change appeared visible under the microscope; the upper portion of the milk in the bottle had become very rich in oil globules by the formation of cream. On the fourth day the casein had coagulated in the milk in the open cups, and the flaky precipitate was visible under the microscope; the pellicle surrounding the oil globules now appeared to be very easily ruptured, and with the slightest pressure some of the globules could be joined together—sometimes a number of globules which had been ranged in line by a current would coalesce by a slight movement of the fluid, and form an elongated mass. Fifth day, no appreciable alteration. Sixth day, the milk which had been placed in the closet had patches of mold visible on its surface; a microscopical examination of this mold showed it to be the Mucor Mucedo, such as I had frequently found on fruit which had been left in this closet. The fungi appeared on the surface only, no trace of it could be found in the milk taken from various depths. The milk in the cup kept in the cabinet exhibited no appearance of the Mucor Mucedo or any other vegetable or animal organism; it had become thickened into a pasty mass, with an intense sour odor. These observations were continued for eleven days, and the only difference observable was in the oil globules—they began to lose their spherical form, as if the investing pellicle had been weakened in parts and had become expanded.

These experiments were repeated with a second supply of milk, which Mr. Kipping kindly supplied, and the results were alike in both cases. The range of temperature during the experiments was from 45° to 63° Fah. These experiments would lead me to believe that vegetable organisms do not, as a rule, make their appearance in pure unadulterated milk unless it is exposed for some time to atmospheric influences; most probably the spores are supplied by the atmosphere. Further experiments are wanted to decide the question. The microscopical examinations should be continued in hot weather. I hope to be able to resume the inquiry next summer under different conditions, which have suggested themselves during the examinations I have detailed. In any case, M. V. Essling's suggestions to bottle the milk is very good, and, in my opinion, cream pans with covers would be a very great improvement on the opens ones as at present employed, at the same time having due regard to the cleanliness of the apartment and the vessels in which the milk is kept.

In a microscopical examination, such as I have recorded, it is quite necessary to have pure materials. The milk as supplied by vendors we know to be very frequently adulterated, and the most simple and easy method is by the addition of water. We know also that in towns where the water has a high character for purity, it sometimes happens in dry, hot weather the reservoirs are charged with vegetable and animal organisms. Milk may not always have town's water added to it; in this case there may be an extra quantity of vitalized matter introduced. What a surprising account a microscopist might furnish from the examination of milk containing such an importation In the cold weather, such as we have at present, animal organisms are not so abundant, and this may account for their absence from a sample of milk obtained in this town, in which I found *Algæ*, but not belonging to the pure milk. One curious circumstance was noticed in this milk, no Mucor Mucedo appeared in or on it, although exposed in the closet for the same length of time as Mr. Kipping's milk, which showed signs of this growth on the sixth day, and on the twelfth day the town milk had none visible. I may mention that pure milk in a bottle securely corked remained fresh twelve days; possibly the low temperature favored its preservation.

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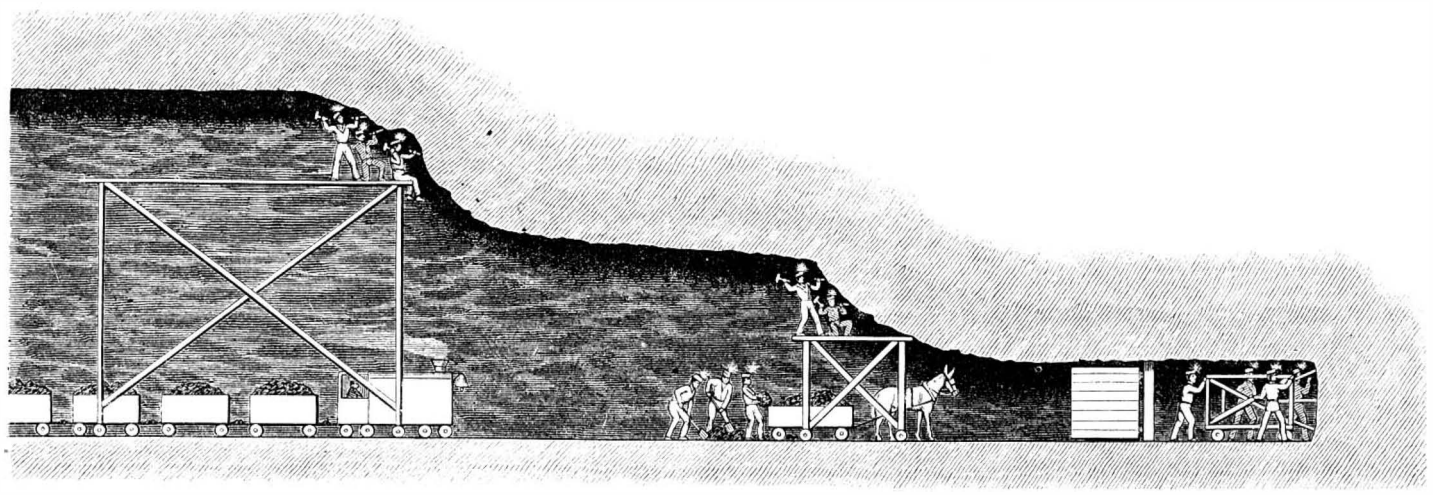
THE HOOSAC TUNNEL.

The attention of the world is so much directed to the Alpine railroad tunnel of Mont Cenis, the connecting link between France and Italy, that we are apt to lose sight of the fact that a similar enterprise, of nearly equal magnitude, is now going rapidly on within our own borders. We allude to the great tunnel through the Hoosac mountains, in the State of Massachusetts. This gigantic work was projected and begun before the European tunnel was fully planned; and had Hoosac been half as liberally supplied with money as Mont Cenis, it would long ago have been completed. But Hoosac, instead of being supported by the treasuries of great empires, has had to depend upon the caprices of the Legislature of one little State. At some periods the Massachusetts Legislature, influenced by a feeling of poverty, would altogether refuse supplies, and then the work had to stop. But when money was again forthcoming, the ring of the drill and the roar of the blast quickly resounded. These alternating periods of idleness and activity have occupied fifteen years; but there is reason to believe that the delays are done with, as the completion of the work is now under positive contract with the celebrated mining engineers, the Messrs. Francis and William Shanly, of Canada. They have engaged to finish the work on or before March 1, 1874; they are energetic men, and the vigorous manner in which they carry things on indicates a completion of the tunnel much earlier than the date of the contract. We lately visited the Hoosac, and desire here to express our indebtedness to the above gentlemen, particularly to Mr. W. Shanly, for personal attentions and facilities in the examination of their remarkable works.



LOCATION, LENGTH, AND CHARACTER OF THE TUNNEL.

The Hoosac tunnel forms part of the line of the railroad from Greenfield, Mass., to Troy, N. Y.; and when the mountain bore is finished, Massachusetts will enjoy two independent roads, extending from its Atlantic coast to the Hudson river, a distance of about two hundred miles. One of these roads, the Boston and Albany, having steep grades and traversing the southern section of the State, has long been in operation. The other, from Boston *via* Fitchburg and Greenfield, Mass., traverses the northern part of the State, through rich farming and manufacturing districts, with easy gradients except at the Hoosac mountains, where it was determined to avoid declivities by boring straight through. The tunnel is to extend in a direct line from the Deerfield river on the east, to or near the Hoosac river on the west, a distance of almost five miles. The bore is to be 20 feet high and 25 feet wide. The altitude of the mountains is 2,500 feet; they are composed of mica slate of variable hardness, some streaks being as hard as flint and difficult to cut. Very little water has so far been encountered in the tunnel, and for the most part it is quite dry. The tunnel rises on a grade of 26 feet to the mile from each portal to the center of the mountains, thus affording constant drainage. The rock formations thus far encountered agree closely with the geological surveys made prior to the commencement of the work. The eastern portion of the tunnel has been advanced nearly a mile and a half into the mountain, the western portion one mile. The tunnel is therefore a little more than half completed.

The contracting engineers have been compelled to make outlays for machinery to the extent of $100,000; and, in addition to this, by the terms of their contract, they were to receive no pay from the State until they had done work to the amount of $500,000. The Hon. Wm. M. Tweed, State Senator, of New York city, is the capitalist who is quietly carrying along the financial portion of this great and interesting work. It is said that the profits on the contract will exceed one million dollars.

HOW THE WORK IS DONE.

Our diagram illustrates the general manner in which the work is conducted. At the extreme inner end of the tunnel, or heading, a large drill carrier is employed, consisting of a strong framework mounted on wheels, and carrying a number of the celebrated Burleigh drills. These drills operate independently, and each is, in effect, a separate engine with cylinder and piston, having for its motor either steam or compressed air, whichever is most convenient. At the east end of the tunnel which we are now describing, they are driven by compressed air. The drills are made with trunnions and other adjustments, so that the position of the drills may be changed as desired; and in practice they are worked in all sorts of positions—upward, downward, laterally, or obliquely, according to the judgment of the miners. The drill carrier is pushed close up to the heading and firmly secured by clamping screws which press against the roof and floor of the tunnel. The drills are then adjusted and secured so as to work on their appointed lines; the compressed air is then admitted to the drill cylinders, causing the drills to fly back and forth against the rocks like shuttlecocks. The drill rods are hollow; and through the center of each, when in operation, a small stream of water is forced, which washes the dust from the drill holes and assists to cool the tool.

The Hoosac drills have 4½-inch cylinders and 9-inch stroke. They make 250 strokes and cut a 2-inch hole at the rate of two inches deep per minute. The weight of each drill and its cylinder is 500 pounds. Cost $125 each.

The compression of the air by which the drills are driven is effected at the east end of the tunnel by water power; four 20-horse turbines being employed, which operate sixteen air pumps each of 13½-inch bore and 20-inch stroke. Not all of these pumps are used at once.

The air is compressed to 65 pounds to the square inch, or a little over four atmospheres, and conducted through an 8-inch cast iron pipe to the drills at the tunnel heading, where branch pipes connect several drill cylinders with this 8-inch pipe. With six of the drills at work and making 250 strokes per minute, the gage on the air pipe at the heading of the tunnel, shows a pressure of 63 pounds against 65 pounds at the pump rooms, one mile and a half distant, being a loss of only 2 pounds. This remarkable fact illustrates the advantage of compressed air as a motor for machinery in mines, tunnels, and other difficult places; the exhausting air also serves the purposes of ventilation.

When the drills have cut into the rock the required depth, say from four to six feet, the drill carrier is moved back out of the way and the corps of glycerin men advance, charge the holes with nitro-glycerin, insert the priming wires, and connect them all with a single pair of electrical conducting wires, which extend back to a safe distance, where the extremities connect with the electric battery. This instrument is contained in a round case about 15 inches in diameter and 4 inches thick, resembling the case of a clock, and having a small crank protruding from its upper surface by turning which a current of electricity is generated. The battery is a magneto-electro machine, the electrical current being produced by causing an armature to revolve near a permanent magnet.

After the glycerin charges are ready, the strong and heavy wooden doors near the heading, shown in the diagram, are closed, forming a protecting bulkhead with a cushion of air between it and the rocks. The signal for firing is then given, the crank of the battery is turned, a flash like lightning is seen around the doors, the mountain trembles, a tremendous roar as of thunder is heard, and a blinding cloud of smoke and dust instantly fills the tunnel. But this is soon cleared, for the ventilation is rapid and effective. In addition to the fresh air brought in and discharged through the drills, a special air pipe, 8 inches in diameter and a mile and a half long, is employed for ventilating purposes. The extremity of this pipe, consisting of a rubber hose, is carried up to the heading after the blast, and the tunnel is soon filled with fresh air which drives out the smoke. The ventilating pipe delivers over 2,000 cubic feet of air per minute.

The bulkhead is now opened and a large force of miners advance to clear away the debris, consisting of many tuns of rock dislodged and broken by the tremendous force of the blast. Small cars are brought up, the stone is loaded in, and the track laid for a new advance of the drill carrier. Mules and small locomotives are employed to haul the cars. The size of the opening drilled and blasted is 6 feet high by 25 feet wide.

Various gangs of men are employed on platforms of different hights, as shown in our sketch, to enlarge the tunnel to its proper size and finish the walls. At present the work of drilling out the enlargement is done by hand; but at the time of our visit an immense Burleigh drill carrier, composed of strong tubular iron, was in part erected, upon which a large number of the atmospheric drills are to be placed. When this gigantic machine is completed, the work of enlarging and finishing the tunnel will be greatly facilitated.

About one thousand men are at present employed on the various divisions of the Hoosac Tunnel. They work night and day, in alternating shifts of eight hours each, making one blast during each shift, and cutting through the mountain at the rate of about 250 feet per month.

THE WESTERN PORTAL

of the tunnel is at North Adams, Mass., a very thriving place, having fine water powers and a number of large manufacturing establishments. But the village is so closely surrounded by hills and the Hoosac mountains, that building lots are scarce and are now being dug out of the hill sides. The cars from Troy, 40 miles, rest at North Adams; they cannot proceed further east until the tunnel is completed. We sojourned at the Wilson House, a large and imposing structure erected by Allen B. Wilson, inventor of the remarkable mechanism known as the Wheeler & Wilson sewing machine. Wilson married at North Adams, and worked here as a humble mechanic. It was while thus employed that he completed the model of his marvelous sewing machine, with which he started off for fame and fortune, *via* the SCIENTIFIC AMERICAN office, New York. This was in 1850. We prepared his specifications and drawings and obtained his patent.

The form and practical operation of the present sewing machines are due to the genius of Allen B. Wilson. Baster plates and other clumsy parts were required in Howe's, and other machines, until Wilson came forward, made the table and the 4-motion feed, and taught the correct principles of construction. From the little model which Mr. Wilson brought to our office in his pocket, has arisen the gigantic corporation known as the Wheeler & Wilson Manufacturing Company, whose annual revenues are estimated at between two and three millions of dollars, and whose splendid fireproof manufactories, at Bridgeport, Conn., cover several acres.

The western mouth of the tunnel is located in a deep ravine at the base or the mountain, about two miles south of the Wilson house. The tunnel is of circular form, 20 feet high and 25 feet wide. The earth at this portion of the works proved to be a treacherous quicksand, through which a tunnel of masonry about 1,000 feet long had to be carried. The arch is composed of eight layers of brick, and its construction was most difficult and expensive.

Up the mountain, about half a mile beyond the end of the brick tunnel, a vertical shaft is sunk to the level of the tunnel, 318 feet, and two headings starting east and west have been made. The latter has been cut through into the brick tunnel, and work upon the other heading is progressing satisfactorily. The west end of the tunnel has now reached a total length of one mile.

Within the building which covers the shaft is a ponderous elevating machine, constantly employed in raising the loaded stone cars and returning the empty. Here also, arranged side by side, in active operation, are a number of 20-horse horizontal steam engines, with air pumps attached. These machines are employed to compress air, which they force down the shaft into the tunnel, supplying motive power to the drills and ventilation for the miners. The Burleigh drills, engines, and compressors are used.

Leaving this shaft we journey over the mountains. The road rises in zigzag lines upon the breast of the mountain, and we soon reach the region of the clouds; through their openings we are permitted to enjoy some of the finest views the continent affords. The Green Mountains of Vermont stretch away to the north, while close by us on the west, old Greylock, the giant of the Hoosac range, looks down benignantly upon the streams and villages, that wind and nestle in the valleys below.

THE CENTRAL SHAFT.

Half way over the mountains is located the grand central shaft of the Hoosac tunnel, 700 feet deep and not yet complete; but the boring is progressing favorably, and it is expected that the tunnel level, a depth of 1,000 feet will be reached sometime during the coming summer, when two headings, one in each direction, will be opened, thereby doubling the rate of progress on the main tunnel. Steam power is employed to compress air, drive the drills, and supply fresh air to the miners, as before described.

The general superintendent of the various mechanical departments of the Hoosac tunnel works, is Mr. Oliver Ayers, of Charlestown, Mass., long and favorably known for his executive abilities and enterprising services in connection with other prominent railway works in this country.

THE DRILLING AND AIR-COMPRESSING MACHINERY.

The drilling machines, compressors, steam engines, etc., are simple, well made, and thoroughly effective. They are, for the most part, the invention of Charles Burleigh. Many attempts have been made to drill economically by the use of machinery; but we believe there are few devices that can compete with the Burleigh drills, especially in difficult situations. It is one thing to cut into stone where the block is under control, and where all the parts can be kept smooth and clean but it is quite another thing to produce machinery that shall work well amidst the rough and tumble of a narrow tunnel, where grit and dirt, so ruinous to exposed machinery, are flying in every direction. But the Burleigh drill stands the severest tests, and may be relied upon to operate effectively in the very worst places; and that is where its assistance is generally most needed. By its use any given amount of rock cutting may be performed three times faster and cheaper than by hand. The drill points will cut ten times further for each sharpening than hand drills.

The Burleigh drills are now at work at Hell Gate rocks, near this city, also in the vicinity of Central Park; at Jersey City, Midland Railway tunnel; Nesquehoning tunnel, Pa.; Delaware & Hudson Canal Co.; Lake Superior, Colorado, Nevada, and Nova Scotia mines; and many other places. The manufacturers are the Putnam Machine Co., Fitchburg, Mass., and the general agents, are Messrs. J. T. & W. H. Daly, 43 New street, New York city.

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One of the largest of the machine shops pertaining to the tunnel is at the east end, located on the edge of Deerfield river, whence power is derived. The foreman of this shop is Mr. R. J. Parker, and it is a well-ordered, efficient establishment, full of intelligent and competent workmen, of whom, we were gratified to learn, a majority are subscribers to the SCIENTIFIC AMERICAN.

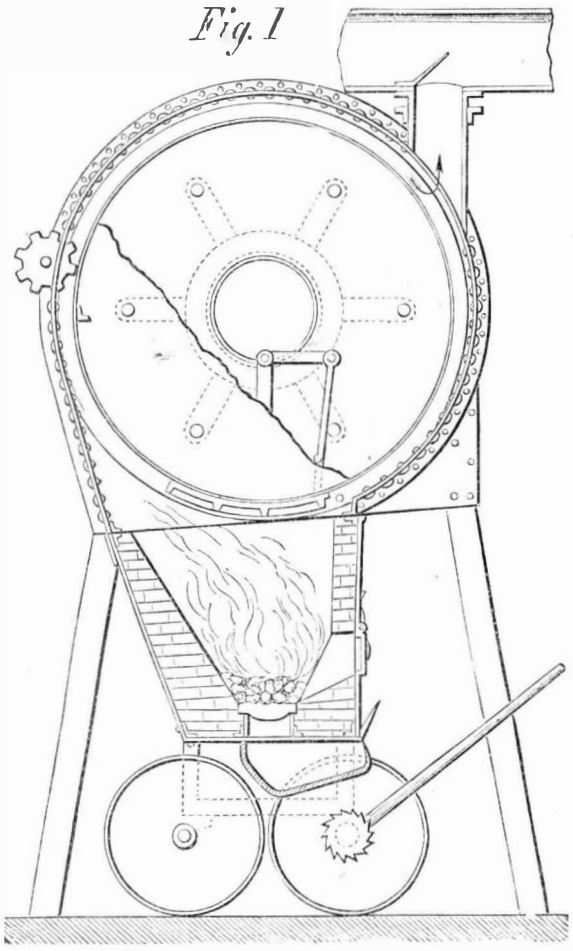
The Mont Cenis tunnel will be 7⅔ miles in length; the cost in all $12,000,000, or $1,500,000 per mile. It is to be finished in 1871. The expense is equally shared by France and Italy. The exact length of the Hoosac tunnel will be 4¾ miles, and the cost $9,000,000, or $1,900,000 per mile.

FRENCH ASPHALT ROADS, AND AMERICAN ATTEMPTS TO IMITATE THEM.

THE MATERIAL.

It has been announced that the New York Central Park Commissioners, have been lately engaged in testing the Seyssel asphalt for the construction of roads and that the results have been very favorable. Much popular misapprehension

Fig. 1



exists on the subject of asphalt. Most people, when asphalt roads are mentioned, get only a confused idea of some sort of artificial concrete made of coal tar and gravel, or some inferior abomination like that which now disgraces Fifth Avenue in this city.

As the subject of road making is at this time one of current interest, and as the genuine asphalt roads in Paris are not only admirable when completed, but the material of which they are made, as well as the methods of making them, possesses points of great interest, we have been at the pains to obtain from authentic sources in Paris, full information and elaborate drawings of machinery, tools, etc., from which the substance of the present article is compiled.

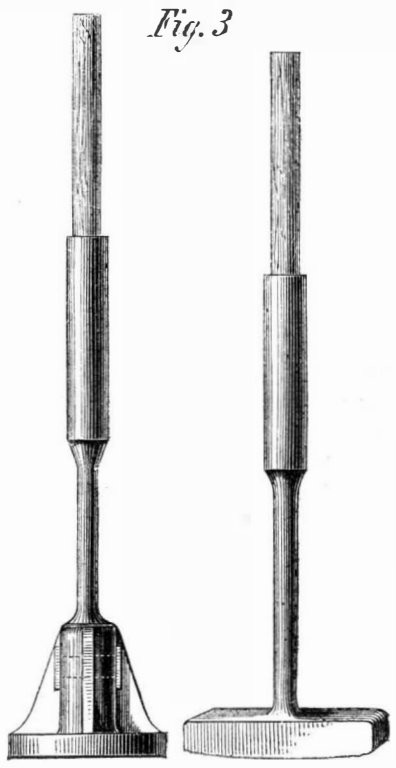
The French asphalt is a carbonate of lime or chalk, naturally impregnated with bituminous matter. Extensive beds of this deposit are found at Seyssel and Pyrimont on the right bank of the Rhone, between the French fortress Bellegrade and the town of Culloz. Large amounts of this rock are quarried and sent to the French capital, where it is used in making the beautiful pavements which now adorn some of the streets of that city.

It is known that in heating asphalt rock to about 212° it disintegrates, and by the softening of the bitumen it turns into a sort of a brown dust. If in that state, while the dust is yet hot, it is compressed in a mold, the particles will stick together, and the matter will resume again, in cooling, its general appearance, hardness, and all the properties of primitive rock, while it retains the shape of the mold.

HISTORY OF THE INVENTION OF ASPHALT ROADS.

The invention of the process now applied to a great number of Paris roads and embankments is due, in some sort, to chance. Pieces of asphalt often fell on the road from the wagons used to transport it from the mines of Seyssel to the manufactories of cement employed to make sidewalks, and were crushed by the wheels; and when the road was covered with these fragments, the heat of the sun produced decrepitation. The wagons wheels, by little and little, compressed the accumulated dust finally into a solid crust, which

Fig. 3



being found an admirable road surface, led to further applications of it to the same purpose.

It was M. Merian, a Swiss engineer, who, in 1849, first improved that lesson of chance and constructed an asphalt surface on the cantonal road of Val de Cravers, which, in spite of the instability of its foundation and the irregularity in repairing, is yet in a perfect state.

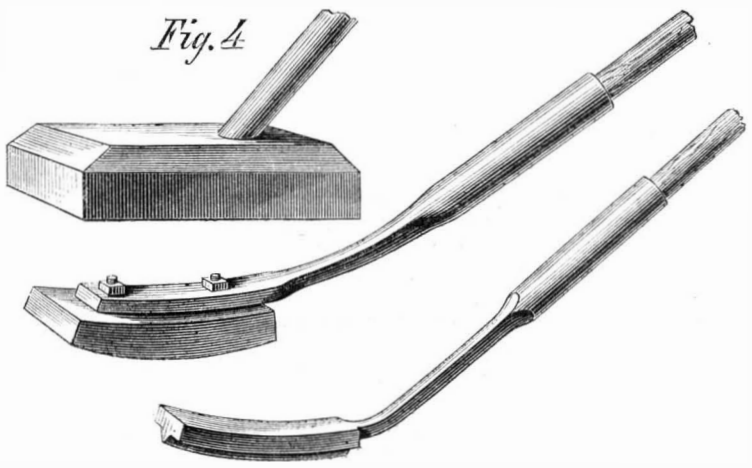
In 1850, M. Darcy, Surveyor-General of Bridges and Roads, in a report addressed to the minister of public works, proposed to apply it immediately on a portion of Paris Boulevards.

However, it was only in 1854 that, under the supervision of M. Hamberg, chief engineer, and M. Vaudry, ordinary engineer of the municipal service, the first asphalt road was constructed in Rue Bergere, Paris, on the remains of a road which had only lasted a few months and in which bitumen had been employed. Since that time the road surface of the Rue Bergere, if we except the portion in front of the Rue du Conservatoire, which is made out of cast asphalt, has never been repaired.

Since 1854, the system of asphalt embankments or roadways has been developed very rapidly. The first attempts in 1854 were made on a surface of about 890 square yards, and four years after asphalt was applied to 8,900 yards.

In 1859, the substitution of asphalt for stone paving was made in Rue neuve des Petis Champs. That operation resulted in some instructive observations. The season was unfavorable being damp and rainy, yet the work was performed notwithstanding. But the beton never got dry, and as travel could not on that account be long suspended in a street so very much frequented, the asphalt was put on a damp surface, and sinking in a very few days, holes and ruts made their appearance. These were produced by steam confined under the bed of asphalt, and the inconsistency of the ground a portion of which was on a loamy embankment of a drain recently built. For this reason it was necessary to make almost a new embankment, in fair weather, and on a bed of dry beton strongly beaten; and since that time the street in question has always been in a perfect state, without any repairing whatever. At the present time the whole surface of Paris asphalt streets comprises about 133,333 square yards.

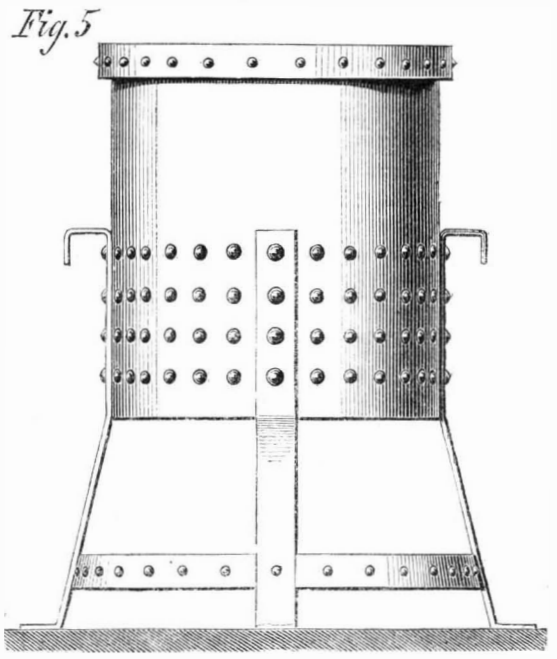
Fig. 4



CONSTRUCTION OF THE ROADS.

The first operation in making an asphalt road is the breaking of the material. This is performed in a crushing mill of

Fig. 5



peculiar description. The rock arrives at Paris from Seyssel in lumps containing several cubic inches. These lumps are first broken in a machine called a rammer, and then fed to a crushing mill. This mill is of English origin and is based upon an ingenious application of centrifugal force. The details, however, are too voluminous to be dwelt upon here.

As soon as the asphalt rock is properly broken and ground into the sort of dust above described, it is put into the torrefactor or dust-heating apparatus. This is shown in section in Fig. 1. It is a stationary machine employed to heat the dust before it is carted upon the road, to avoid the unpleasant smell caused by heating in the public streets. It is made on the principle of the well known coffee roasters. An internal sheet iron cylinder is made to revolve in an external one by means of a worm gear. In the interior one is placed the asphalt dust, and the heat passes up and around it from a portable furnace. This portable furnace is placed on wheels so that when the dust is sufficiently heated it may be drawn from under the cylinder, and replaced by a cart to receive the

Fig. 2.

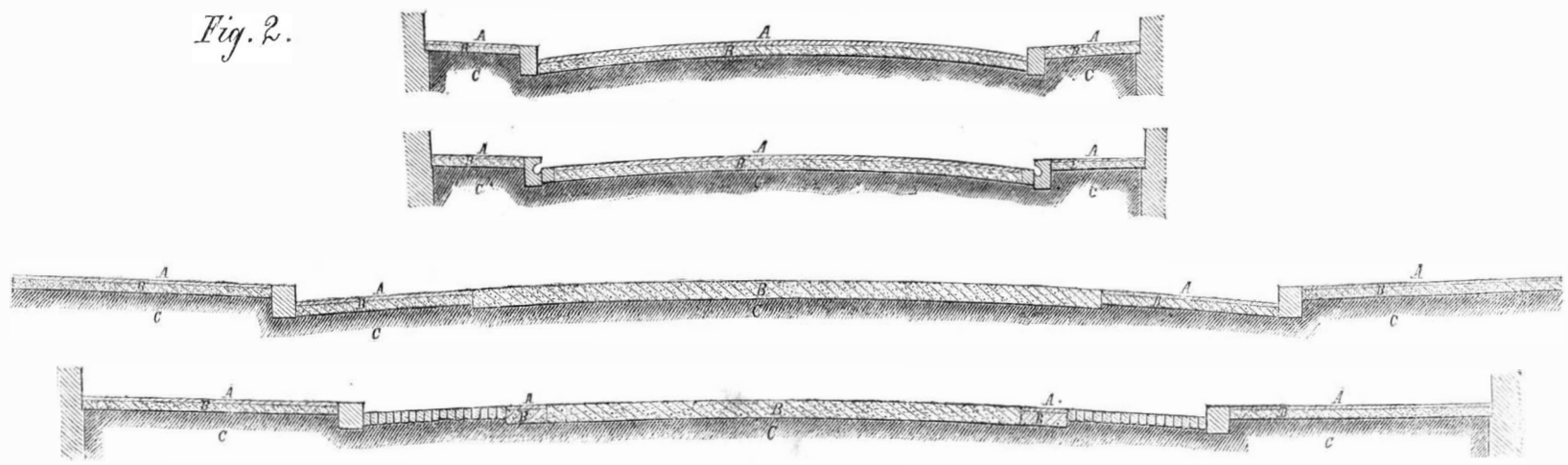
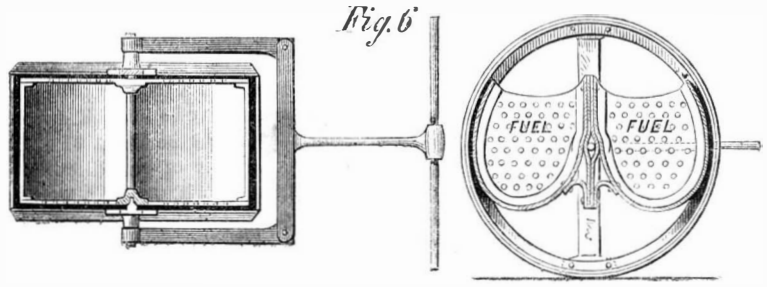


Fig. 6



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dust from the heating cylinder. The carts are of sheet iron and the asphalt being a bad conductor of heat, cools very little during the transportation from the heater to the road surface.

Arriving at the place of deposit the dust is distributed and consolidated by hot and cold compressing rollers, and other tools hereafter to be described. The surface of the soil of the roadway is laid up to the proper convexity, and a layer of beton is put down, upon which the asphalt is concreted. Sometimes the entire roadway is covered with asphalt, and sometimes only a portion. Our engraving, Fig. 2, shows four different styles of roadway; A showing where the asphalt is used; B, the beton; C, the underlying soil; and D, blocks of stone like our Belgian pavement.

Before the beton is laid down, the ground is duly stamped and prepared for its reception. The whole operation should be performed only in favorable weather for reasons assigned above. The heated asphalt dust from the sheet iron carts is first spread over the surface with an iron rake or shovel, and is then stamped and partially compressed with the tools shown in Figs. 3 and 4. These tools are heated by means of a furnace shown in Fig. 5. The heating of these tools as well as that of the hot compressing roller is done, not that it is necessary to conglomerate the asphalt but to prevent the inconvenience of its adhesion to them. The material does not stick to a hot metallic surface.

The cold compressing roller used after the surface has cooled is not different from that in ordinary use in this country, and therefore need not be described. The hot compressing roller is on the contrary quite peculiar in construction. This is shown in section and plan in Fig. 6. An iron grate or basket is pivoted on the axle within the external compressing cylinder, and in this basket is carried a coal fire, the basket being so pivoted that it will hang below the axle in an upright position.

The various tools shown in Figs. 3 and 4 are adapted to smoothing the surface in different parts, and to shape the gutters along the edges of the sidewalks previous to the action of the hot compressing roller.

These details will give a fair idea of the nature of the genuine asphalt, and the method of making it into roadways.

AMERICAN ROADS.

So far as we are aware, no deposits of similar material have been found in America. The attempts to use asphalt have been confined to material imported for the purpose. Most, if not all, of the various forms of concrete made with coal-tar and pine-tar, mixed with gravel, coal ashes, etc., have proved incapable of withstanding the effects of frosts or of heavy travel.

Should the asphalt prove to answer the purpose, there seems no reason why an artificial asphalt might not be made which would answer the same purpose. Whether the bitumen found in the Seyssel asphalt is of such peculiar adhesiveness that no other substance can be found to equal it in this respect, we cannot say, but it appears to us that its peculiarities arise more from the way the carbonate of lime and the bitumen are naturally mixed than from any chemical peculiarity. If this supposition be correct, it would seem possible to produce an artificial asphalt rock, as good as the natural deposit. The natural indication seems to point directly to a composition of carbonate of lime and bitumen, for road surfaces. Immense quantities of bitumen exist and can be obtained at a very cheap rate. An almost inexhaustible supply of it is found in the pitch lake of Trinidad and it is of very adhesive quality. Should the adaptability of asphalt to American roads be demonstrated, it would seem that some experiments with an artificial material of a similar nature might be a promising venture.

[For the Scientific American.]

NEW PAINT.

BY C. WIDEMANN.

By adding to a solution of chloride of zinc some white oxide of zinc in powder, a cement is obtained, known as "Lallement's Cement," which is used for stone and metals, and is also frequently employed by dentists for filling decayed teeth, on account of the oxy-chloride of zinc thus obtained which is insoluble, white, and very hard; it is also used in modeling objects of art of a very fragile nature.

For painting purposes the oil and essence generally used can be replaced by an aqueous solution of chloride of zinc to which tartrate of potassa has been added.

In order to give body to this mixture a certain amount of potato starch is added; in submitting *this* mixture to heat, the starch is dissolved, and in cooling it gives the required consistency.

Having added to the powdered oxide of zinc, the mineral or vegetable colors (also powdered) which it is intended to use, the oxide of zinc thus colored is mixed with the aqueous solution of chloride of zinc, and the whole applied by means of a brush on the surface to be coated. The mixture soon dries after its application on account of the production of oxy-chloride of zinc, the whole will dry perfectly in half an hour.

The alkaline tartrate added has for its object to delay this drying, which without it would be too sudden.

To obtain white paint the above mixture may be employed without the addition of any coloring matter, as the oxy-chloride of zinc gives a very fine white color.

The advantages of this paint are the following:

First. They are more durable than oil paints, and do not blacken by exposure to sulphurous vapors.

Second. Devoid of any odor, and drying quickly, one coating can be applied in winter every two hours, and every hour in summer; so that a room can be completed in a day's work.

Third. Resisting dampness, and the action of water (even boiling), it can be cleansed with soap, as is ordinary oil paint.

Fourth. This paint containing the chloride of zinc is antiseptic, and preserves wood against decay.

Fifth. It diminishes the combustibility of the substance to which it is applied, as chlorine renders hydrogen incombustible in combining with the latter to form hydrochloric acid, which cannot be decomposed by heat. A certain quantity of borax may also if desired be added to the solution so as to increase its incombustibility.

Sixth. It is manufactured without danger to the health of the workmen.

Seventh. The oxide and the chloride of zinc are found in the trade at a low price, and these substances can be kept without alteration any length of time, in any climate.

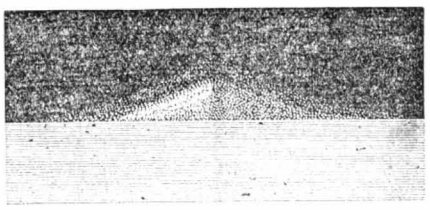
Correspondence.

The Editors are not responsible for the Opinions expressed by their Correspondents.

State of Steam over the Water Level in Steam Boilers.

MESSRS. EDITORS:—In my last the exceeding rapidity of water circulation in a good boiler was noted.

I will here speak of the actual state of things as I found them above the water level of the same boiler. By the use of a great number of small try cocks along the side, I found what I shall call a wave of spray, composed of tiny drops lifted mechanically by the rapid upward current of steam just over the greatest heat; ever varying in density and shape, ever doing its quiet and useful work of separating the new made steam from its accompanying water. This wave had an outline something like the accompanying sketch.



As I am not writing for any boiler but only seeking truth, I give nothing of outline but simple interior, showing the unstable wave of spray covered by a layer of damp fog or very cloudy steam, the whole rising from 8 to 10 inches at the highest part. I noted particularly that this never moved forward near enough to the try cocks in front of the boiler to be detected by them, but kept hovering over the hottest part of the boiler.

After finding this to be the case, I very unwisely tried to get dry steam from the back end of a long boiler, which was making nearly all its steam over the fire at the front. I failed to get dry steam, although I had really more steam room than in the first experiment which had yielded such good results; but searching as before for the truth, I found my poor wave of spray on a terrible bender—demoralized to the last degree, distorted, broken and mixed, rolling, tumbling over the surface, swept before the current of steam made at the front with no exit but at the back. There was the trouble—what had I been thinking of?

My remedy was clearly pointed out, and quickly made and tested. I simply put the same number of cubic feet of steam space over the steam produced, imitating the outlines nature had given me as near as I could. All was right. My wave of spray went soberly to work under its tent-shaped steam room. It gave me dry steam once more at a rapid rate, and so has been doing ever since.

Olney, Ill. T. L. L.

Spontaneous Combustion of the Human Body.

MESSRS. EDITORS:—In a recent number of the SCIENTIFIC AMERICAN it is stated that Mr. A. B. Flowers, of Alexander, La., considers that he has found a "mistake" in the article on this subject reprinted some weeks ago from the *Boston Journal of Chemistry*. If he will take the trouble to look at the article again, he will see that the statement that "no one has ever witnessed a case of such spontaneous combustion" is given as one of the points in which the fifty cases investigated by Liebig agree, according to the account of that eminent chemist. The writer of the article makes no assertion of the kind on his own responsibility.

We wish that Mr. Flowers would give a more detailed account of the case mentioned by him. We should not infer from the paragraph in the paper that the body was consumed or even burned at all. The breath from the mouth and nostrils appears to have contained so much alcoholic vapor that it took fire, and death was the result. Was it an open fire near which the person was sitting? And is it not possible that the vapor took fire in much the same way as naphtha vapor might under similar circumstances?

If the body could be burned up in the manner described by the old writers on spontaneous combustion, it would seem that it ought to have happened in this case. These authorities (?) state that the flame cannot be extinguished by any ordinary means—and this assertion may be found in so recent a book as "Steele's "Fourteen Weeks in Chemistry," published for *educational* use in the year of grace 1867!—and that the body may be burned to ashes without even scorching the clothes. How was the fire put out in this case? or did it go out of itself, and, if so, how soon? Has any full description of the case been published in any medical or scientific periodical? If not, it is very desirable that either Mr. Flowers, or some other of the eye witnesses should prepare such a description at once.

The last alleged case of spontaneous combustion of the body, reported in full and carefully examined by competent medical men, was that of the Countess of Goerlitz, June 12, 1847. In that instance the Hesse Medical College, after due investigation, reported that the person had not died from spontaneous combustion. The case was then referred to Liebig and Bischoff, whose report was to the same effect. It subsequently appeared from the confession of the man who committed the murder, that the Countess had been strangled and the body wilfully burned after death.

Much interesting matter on this subject may be found in Dupuytren's "*Leçons Orales*" and in Taylor's "Principles and Practice of Medical Jurisprudence." *

Leclanche's Battery.

MESSRS. EDITORS:—I see in the last number of the SCIENTIFIC AMERICAN, that you desire some information on Leclanche's battery. Starting on very judicious considerations, M. Leclanche has devised a single liquid battery, and obtains a constant current by an arrangement unknown before; all the batteries giving constant currents being hitherto employing two liquids.

In every battery, the body receiving the positive electricity must be inoxidizable, a good conductor, and possess such affinity for hydrogen that the latter is seized as soon as produced, and thus the perturbations caused by the presence of free hydrogen are prevented.

The peroxide of manganese possesses all these qualities in the highest degree, being inoxidizable, insoluble, and possessing great electric conductivity and affinity for combustible bodies. It therefore constitutes a very good positive element.

As a negative body, M. Leclanche retains the zinc, which possesses all the requisite properties for the purpose. As for the liquid coming in contact with the two poles, the hydrochlorate of ammonia, or the commercial sal ammoniac, has received M. Leclanche's preference.

Practically, for the sheet of peroxide of manganese, M. Leclanche has substituted crushed peroxide, kept in a porous jar; the positive electricity of this mass is collected by means of a plate of gas carbon. It is necessary to use a very pure peroxide. A good conductor, the best known for this purpose, is known in the market under the name of *manganese aiguilli*. It is crystallized, silky, and possesses a very pronounced graphitoide luster. If it joins to these qualities that of being hard, it is then the best conductor. To use this peroxide first separate it from the *gangue*. Then crush the mass into coarse grains. It is then passed over a metallic wire cloth to separate the dust; an equal quantity of crushed gas carbon is added, and you have thus the best conducting body.

As for the solution of sal ammoniac, it is better to use it always at the highest degree of concentration. By adding to the liquid an excess of this salt, it gradually dissolves and keeps up the strength of the solution. Care must be taken that this solution does not wet the porous jar higher than the middle, as the drier the mass contained in the porous jar is kept, the better are the conditions of conductivity and working.

This battery possesses a considerable electromotive power. This power is represented by 1·382, the power of the sulphate of copper battery being taken for unity. Its resistance is relatively very weak, a very advantageous circumstance for telegraphing.

Experience has proved that 28 elements of Leclanche's are amply equivalent to 40 of Daniell's. The Leclanche battery, put in comparison with the Marie, Davy, or the sulphate of mercury battery, much used latterly on telegraph lines, is preferred as it requires less care; the sulphate of mercury being also more expensive.

The cost of the sulphate of mercury in France is from 3 to 3½ francs per kilogramme, or 2 pounds 4 ounces supposing all the residues collected and resold without loss; but as this is practically impossible, the cost is 7 francs per kilogramme. The kilogramme of manganese costs from 16 to 17 cents.

An element of Leclanche, remaining a year without working, will lose nothing except by the oxidation of the zinc in the atmosphere, and this is so insignificant it does not amount to one per cent. It is always ready to be set at work, and will last in a telegraph service from one to three years.

Over 20,000 elements of Leclanche are actually in use by different railroad companies in France and Belgium, and numerous telegraph stations have been working with perfect regularity for two years without the least interruption. It is principally used in France, Belgium, Holland, Austria, and Italy.

In France the *Chemin defer de l'Est* has adopted it, and the *Compagnie de d'Ouest* employs it with the apparatus of Tiers. It is also used in a great number of establishments for galvanoplasty, gilding, and silverplating, and at Brussels (Belgium), it regulates all the electric clocks.

C. WIDEMANN.

Firing under Steam Boilers.

MESSRS. EDITORS:—The article from *The Engineer* on repaired boilers, in a late number of your journal, is so deeply interesting to me that I am strongly impressed to respond to it. I am well acquainted with the iron works referred to; and from my own knowledge I beg leave to speak in reference to their method of firing, as some of those boilers were known to me. They are fired at one end with slack of bituminous coal, fire space very large; and when the fire becomes incandescent great heat is evolved. The slack is generally thrown on while the fire is clear and in good condition, so as to more readily ignite it. But, to do this, it seems to be necessary to open the fire doors, which are generally large. Then what must be the effect of all the cold air that rushes in, while more slack is being thrown in? When once in, the

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fire is cooled down very low. However, that is the practice, for the fireman thinks that one good firing is better than applying a little at a time, which would be the most judicious mode of firing. Thus we see the boiler is submitted alternately to intense heating and cooling, causing expansion and contraction to occur alternately, which operates on the patches, and on all weak parts, similar to expanding and contracting a pair of smiths' bellows.

It has been the grand object of my life to remedy the defects above mentioned, and I hope soon to present the world with a furnace that shall equalize at all times the temperature of steam boilers. ELI SLATER.

Philadelphia, Pa.

Cheap Cotton Presses.

MESSRS. EDITORS:—I notice in your issue of Jan. 1, an inquiry for a "cheap cotton press," one that is within the means of a small planter, and which would be capable of putting forty pounds into each cubic foot. Having had twenty years' experience in manufacturing and supplying plantation machinery, my views on this subject may not be uninteresting.

But few persons unacquainted with pressing cotton, have any idea of the power that is required to press forty pounds of cotton into a cubic foot. If they will make the experiment—which can be done by taking a box one foot square, and six feet long, provided with a follower, at the top of which is a platform for loading with weights—they will find that at least twenty-five tuns will be required to force the follower to within twelve inches of the bottom of the box, or, in other words, to put forty pounds into a cubic foot. Estimating bales to average five hundred pounds each, about twelve cubic feet would make a bale, and would require the enormous pressure of over three hundred tuns. Any mechanic acquainted with the strength and cost of materials, knows that a "cheap" press to do this is an impossibility. The material alone would cost more than a small planter should pay for a press. Bales of this weight per foot are only made on the most powerful hydrostatic and steam presses to be found in all of the larger seaports of the South.

The bales, as they are received from the plantations, range from twenty to twenty-five pounds to the cubic foot, and contain from twenty-five to twenty cubic feet. To make these bales, a power of from four to five tuns to the cubic foot is needed; so that the pressure now required in making common bales is from eighty to one hundred tuns—a power which but few of the best presses will give, and work to the satisfaction of the planter.

These bales are, before shipment, where there is a steam press at the seaport, "compressed," as it is termed, and the bale reduced from one third to one half in size.

Such being the facts as they exist, the only remedy is in a reduction of the size of the bales, so that the same power which is now applied on the plantation, to a bale of twenty cubic feet, will be applied to one of, say, four cubic feet; which will put the forty pounds into each foot, and save the expense of compressing. Such bales could be easily handled, and would not be torn by hooks or rolled in the mud and water, as the present sized bales are. The press could be made smaller, would cost much less, and could be easily transported at low rates of freight. The manufacturer would receive his cotton in better order, and lose less by stealing and dirty cotton. With the present mode of packing cotton, it is estimated that after a bale leaves the planter it loses five pounds on an average, before it is consumed by the manufacturer; much of which could be saved by the substitution of small bales. J. M. ALBERTSON.

New London, Conn.

How Small Things are Utilized.

MESSRS. EDITORS:—Reading the article in No. 3, current volume, entitled "How small things are utilized," called to mind two more facts of the same nature. I send them to you to do with as you may deem proper.

In the process of currying, leather is "stuffed" with fish oil and tallow. After stuffing, thin shavings are taken off by the workman. These shavings are purchased by parties who boil them down and extract the oil and tallow. The oil is made into "whale-oil soap," which is used by wool manufacturers for cleansing their goods. The tallow is made into common soap. The residue, after cooling, is cut into cakes and used as fuel to boil the next lot. Being more than sufficient for that purpose, the balance is sold for fuel or for manure.

The cotton waste used in some of our large machine shops and railroads is cleansed to be used again, and the oils also used for the same purpose as above. A READER.

Boston, Mass.

THEY tell a good story of a certain well-known professor of natural science. It was the custom of the doctor to encourage his geology class to collect specimens and bring them into the class for analysis and classification. So, one day a number of specimens were laid upon the table, and among them one broken bit, which, although streaked and stained to impose on the doctor, was really nothing but a piece of common brick. In due time the professor came to the specimens. Taking up one, he says at a glance, "This is a piece of baryta from the Cheshire mines;" holding up another, "This is a piece of feldspar from the Portland quarries; the next is a piece of quartz from Hadam; and this," coming to the brick, "is a piece of impudence from some member of this class."

THE well-known collection of minerals which Professor Bruce commenced at Princeton, N. J., in 1790, and which now numbers about five thousand specimens of American ores, is to be placed in the museum of the Maryland Academy of Sciences in Baltimore.

The Washington Street Tunnel, Chicago.

From the Eighth Annual Report of the Board of Public Works of the city of Chicago, we are able to condense an interesting description of the character and final success of the above important work. The facts given are of much importance at the present time when so much attention is attracted to methods of communication between New York and the cities separated from it, by the North and East rivers.

The tunnel passes under the Chicago River, with its center line in Washington street. The eastern approach commences in the center of Franklin street and the western approach terminates in the center of Clinton street. The grade at Franklin street is 11·5 feet, and the grade at Clinton street 13·5 feet above low water or city datum line.

The bottom of the tunnel, or top of invert in the center of the river, is 32·4 feet below low water or city datum. The grades between the ends of the approaches and the center of the river are uniform, except 101 feet each way (east and west) from the center line of the river, in which there is a rise of 2·33 feet. The tunnel under the river comprises three passage ways; the south one for foot passengers, and the other two for horses and vehicles. The south passage is 10·83 feet high measured from the top of the invert to the bottom of the upper arch, and 10 feet wide. The other passages are 15·07 feet high and 11 feet wide.

These two passages for vehicles, however, extend only 111 feet each way from the center line of the river, where they merge into a single passage 23·33 feet wide, which is further narrowed in a distance of 40 feet to a width of 19·5, which is then maintained to the extremities of the tunnel. The entire length of the tunnel, including the open approaches from the centers of Franklin and Clinton streets is 1,605 feet 9 inches.

An interesting trial was made soon after completion of the tunnel, the object being to ascertain what loads could be conveniently drawn up the grades of the tunnel—and to prescribe limits to such, if it was found necessary. The trial took place January 26th, 1869, and the results are given below.

The steady throng of pedestrians and vehicles through the tunnel gives the best possible testimony to its utility. In the ease with which the passage under the river is made by pedestrians, and by all except very heavily-loaded teams, it more than answers all that was anticipated of it.

The passage through was from west to east, the teams entering at Clinton street in the west division, and coming out at Franklin street in the south division. The teams were all two-horse teams, and the vehicles four-wheeled trucks.

The descent from Clinton street to the bottom of the tunnel, is 43·75 feet, and the declivity 1 foot in 18·6265. The ascent from the bottom of the tunnel, to the eastern extremity of the approach at Franklin street, is 41·77 feet, and the declivity 1 foot in 16.

This last grade, it should be remarked, is regarded by the board as steeper than is desirable.

The distance through, from the top of the western approach to the top of the eastern, is 1,608.

	Pounds.
FIRST TRUCK.	
Weight of team, 2,600 lbs., weight of truck	2,840
" load	3,605
	6,445
SECOND TRUCK.	
Weight of team, 2,500 lbs., weight of truck	2,800
" load	3,700
	6,500
THIRD TRUCK.	
Weight of team, 2,500 lbs., weight of truck	3,200
" load	4,080
	7,280
FOURTH TRUCK.	
Weight of team, 3,000 lbs., weight of truck	3,485
" load	5,200
	8,685
FIFTH TRUCK.	
Weight of team, 2,600 lbs., weight of truck	2,800
" load	6,365
	9,165

The trial, it will be observed, took place in winter, the roadway of the open approaches being somewhat snowy and slippery. All of the teams passed through without stopping. All but the last pulled up the ascent with ease; the last team with difficulty. Its gross load of over four and one-half tuns, was apparently about the measure of its strength.

Photography on Canvas.

We were recently favored by Mr. Lothian, of Edinburgh, with a sight of some admirable examples of the mode of printing introduced some months ago by Mr. Davies, by which almost any surface, no matter how unsuitable for photographic purposes, gave fine pictures after treating with a sizing preparation consisting of a mixed solution of shellac and gelatin. It was suggested at the time that such a process appeared to be pre-eminently well suited for printing on canvas; and Mr. Davies and others promised to put the matter to the test of experiment. This has been done, and Mr. Lothian, who is well versed in canvas printing, has worked in conjunction with Mr. Davies for this especial branch, and with such satisfactory results that he has resolved to use no other.

For printing on canvas the chief modification of the formula consists in diluting the sizing solution considerably. The surface of the canvas, primed for printing, being non-absorbent, a much thinner coating of the lac and gelatin solution is desirable, as a thick film might cause some eventual tendency to exfoliation. The formula as originally given by Mr. Davies is as follows:

Take from four to six grains of gelatin, soak it in an ounce of water for an hour, then melt it gently over a fire, hot plate, or water bath, using a clean earthen pipkin. When fully dissolved, add to it, while yet warm, and stirring it gently during the mixing, from four to six drachms of a solution of white lac in methylated spirit, if for white or pale surfaces; but orange lac will do if the surface be of a darker color. This is made in the proportion of 6 ounces of spirit to 1 ounce of lac, and digesting it till fully dissolved. The mixture of the gelatin and gum lac in spirits produces a creamy-looking emulsion, to which is added four grains of chloride of sodium, or a like equivalent of chloride of ammonium or barium, and, when fully dissolved, filter through fine muslin into a clean pipkin, and it is ready for use.

This is, we believe, the formula still employed for paper with success, and we may remark, in passing, that for paper, a fifty-grain ammonia-nitrate solution gives a rich, velvety quality of picture, which is, in our estimation, much superior to that obtained with the plain silver solution. When the ammonia-nitrate is used, a fine, rich, purple brown tone is obtained by fixing in hyposulphite of soda, one part in eight of water, without toning.

In applying the process to canvas printing, the lac and gelatin solution is to be diluted with an equal bulk of water, or, we should presume, better still—in order to avoid the risk of precipitating any portion—with equal parts of alcohol and water. If the preparation be made for use with canvas, of course it will be made of the proper strength at once; but if the mixed solution have been prepared for paper, it must be warmed, and the proper proportion of alcohol and water added, a little at a time, stirring briskly. The preparation thus diluted remains fluid, and requires but slightly warming for use.

Previous to applying it to the painter's canvas, the prepared surface of the latter is sponged with a little methylated spirit, to remove dirt or grease, and prevent any tendency to repel the sizing solution. When the surface is dry, the lac and gelatin solution is applied smoothly with a sponge. The surface dries in a few minutes. The silver solution is applied with a tuft of cotton wool. We may observe here that ammonia-nitrate of silver is on no account to be used in exciting the canvas, as the alkali, rapidly acting on the priming of the canvas, would penetrate and dissolve it. The silvered surface being dry, the canvas is placed under a negative and exposed, the printing being more rapidly effected than with albumenized paper. When sufficiently deeply printed, the canvas is turned up at the edges, and secured at the corners by spring clips, so as to form a dish. Into the dish so formed the hyposulphite fixing solution is poured, and suffered to remain about ten minutes.

Mr. Lothian states that by observation he had arrived at a criterion of perfect fixation. When the surface is so thoroughly permeated by the fixing solution that it felt slightly soft and yielding when pressed by the finger, instead of being perfectly hard and rigid, experience has proved that the image is perfectly fixed.

When the image is fixed, one corner of the canvas is released from the clips; and, after pouring away the hypo., the surface is washed for a quarter of an hour by means of a flexible tube attached to the water pipe, care being taken at no stage of the proceedings to wet the back of the canvas. No toning is necessary, as the image, when fixed only, is of a rich, warm, purple brown tint, well suited to the purposes of the oil painter.

It will be seen that in this form of canvas photography printing direct from the negative is contemplated; where enlarging is necessary an enlarged negative is used, and a direct print produced therefrom. There is little doubt, however, that by the use of iodides and bromides the surface prepared with the same sizing solution might be made sufficiently sensitive for solar camera printing by development. —*Photographic News.*

Breech Loaders.

The breech-loading systems which have been adopted by the armies of the European States appears in the "Eastern Budget:" England—for the conversion of old rifles, the Snider; for new rifles, the Martini-Henry. France—for the conversion of some old percussion muskets, the Snider; for the new rifles, the Chassepot; a metal cartridge is now being made for the latter weapon, the old paper cartridge not being considered satisfactory. Russia—the Kruka for conversions, the 50,000 rifles already converted according to the Karte system having proved failures; Russia has also ordered 30,000 Berdan rifles from America, some of which have already arrived. Sweden and Denmark—the Remington, with Austrian barrels. Norway—not settled. Italy—Pettiti, similar to the Chassepot (for conversions only). Switzerland—for conversions, the Millbank-Amsler; for new rifles, the Vetterli; Switzerland also possesses 10,000 Peabody rifles. Turkey—the Snider, for conversions. Belgium—the Albini. Spain—the Remington. North-German Bund—the needle gun. Bavaria—for conversions, the Lindner-Podelwils; for new rifles, the Werder. Holland—the Snider, for conversions. Montenegro has obtained 2,000 Kruka rifles from Russia. Austria—for conversions, the Wanzl; for new rifles the Wernal. Papal States—the Chassepot. Roumania—the Peabody.

A PATENT for warming piano-forte keys, so as to make practicing a pleasure in the coldest weather, is announced in London. The improvement is made by means of little cylinders of hot water concealed under the keys.

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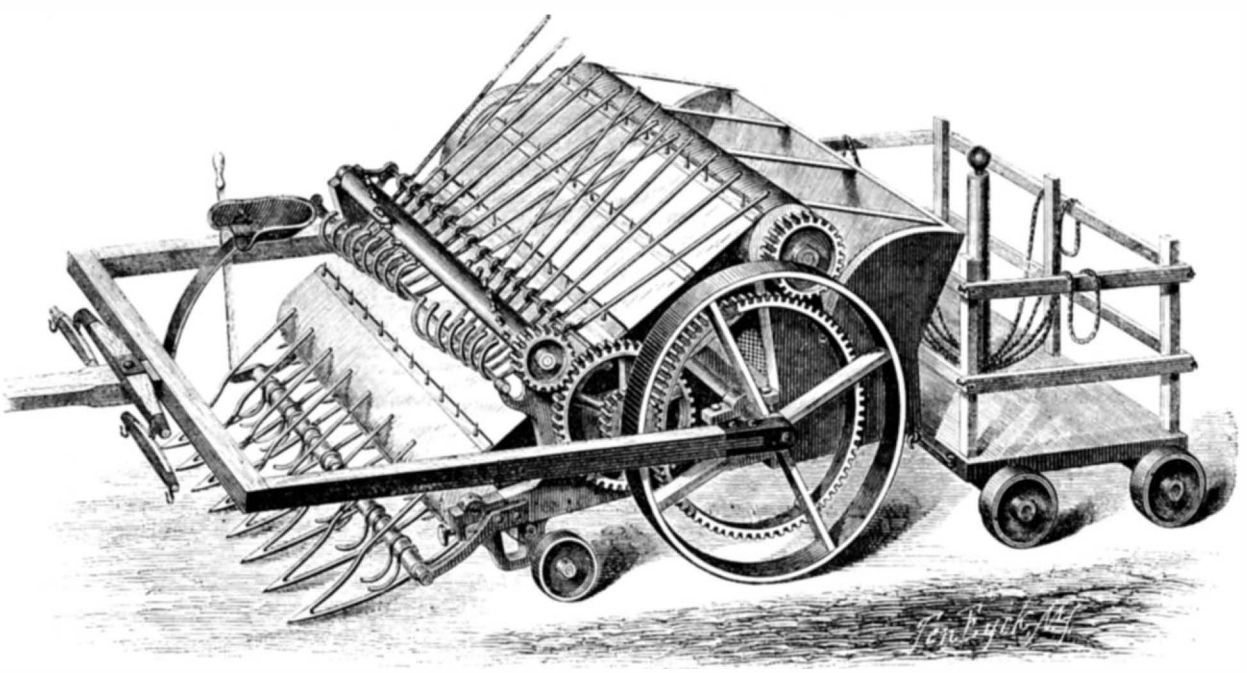
Combined Hay Rake, Thrasher, Loader, and Stacker.

We have spoken in previous articles of some peculiar combinations in agricultural machinery, designed to perform simultaneously several kinds of work. The machine herewith illustrated is a combination of this kind. Its general appearance is well shown in the engraving, but as all the parts cannot well be referred to in detail in an engraving made on so small a scale, we must content ourselves with such a general description as shall give the reader a conception of the character of the machine, and the work it is designed to perform.



HAMMOND'S HAY RAKE, THRASHER, LOADER, AND STACKER.

The machine is drawn like the ordinary mowing machine, and the movable parts are also impelled by driving wheels, in a similar manner to that by which the working parts of mowing machines are actuated. The hay is gathered by curved teeth at the front of the machine. From the gathering teeth it is caught by rows of short straight teeth, attached to an endless apron or carrier, and is drawn back toward a truck-rack at the rear of the machine. The endless apron or carrier is made of canvas, or other suitable material, and its upper half passes, in its progress toward the truck-rack, under a series of rods, or whippers. These rods, or whippers are driven by a cam-roller, which causes them to beat the hay violently. The seed thus beaten out is caught in the endless apron, and deposited in a box placed between the endless apron and the truck-rack. A forcible motion is imparted to the beaters by means of springs.

A set of gleaner teeth supplement the work of the first teeth, and when they become charged, a lever is employed to bring them so near the teeth on the endless apron, that their contents are seized and carried back with the rest of the hay to the truck-rack. The gleaning teeth are then dropped into the position shown in the engraving.

The truck-racks, of which there should be a sufficient number to keep the machine in full operation, are detachable; and as soon as one of them is loaded with hay it is replaced by another, and the loaded one is drawn to the stack or mow, where it is elevated by a derrick, and its entire contents are discharged at once.

The inventor has also devised a convenient derrick, calculated to facilitate the operation of stacking. If the hay is to be pressed, it is lifted only from the truck to the press, the charge of the truck-rack being just enough for a bale. When the loads are deposited in the stack or mow, they are readily separated, and the mass divided without the use of a hayknife.

The seed, in passing from the endless apron to the seed-box, is screened by the action of two wires of different fineness.

Although it is employed in a modified form, we have in this device a recognition of the principle enunciated in our description of another hay-loading machine in this issue, namely, the endless apron to convey hay from the rake to the load. We repeat that in our opinion this principle will, in various forms, be ultimately employed in most machines of this class, and the time cannot be far distant when machines for loading hay will be as common as horse hay forks.

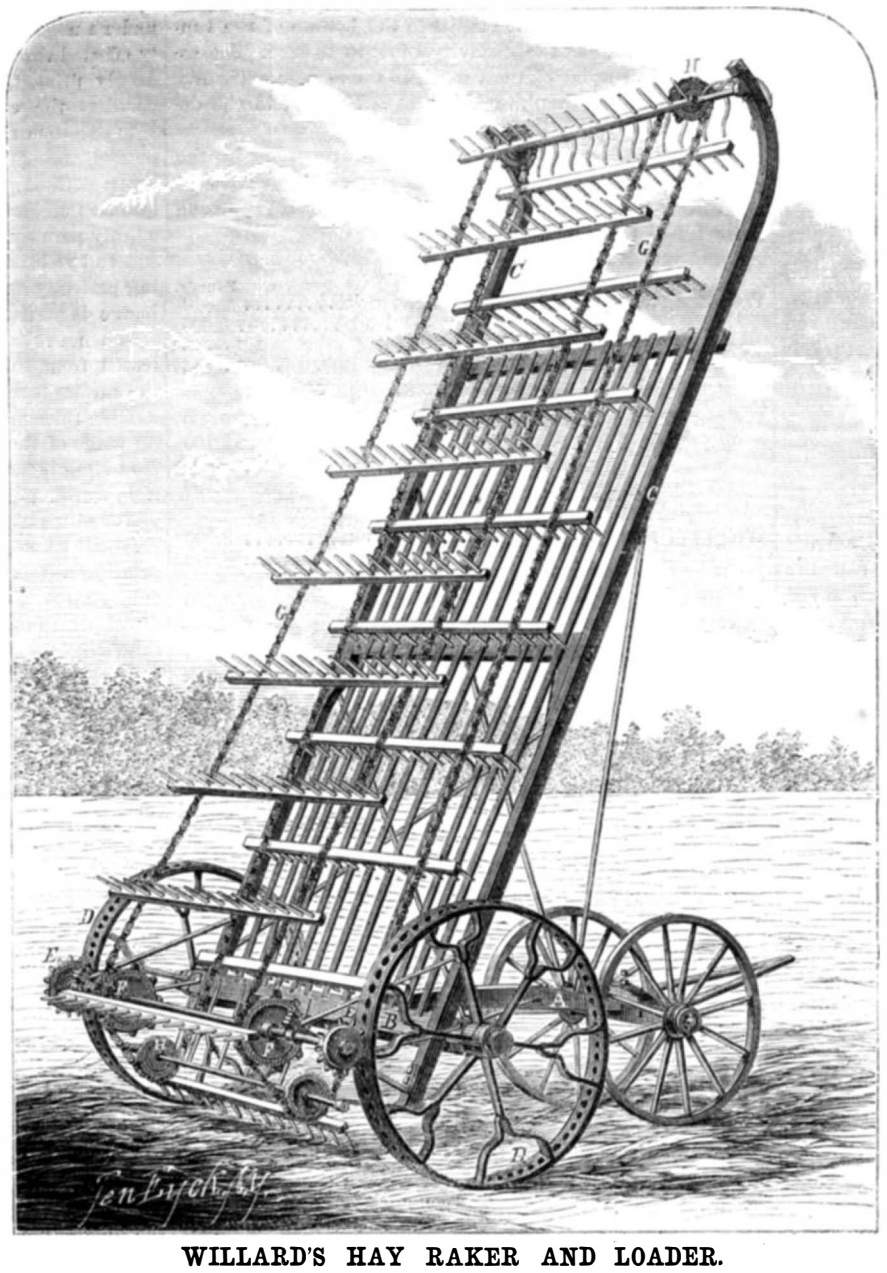
This invention was patented through the Scientific American Patent Agency, November 30, 1869, by James R. Hammond, of Sedalia, Mo., whom address for further information.

Hay Raker and Loader.

We have already said so much on the importance and necessity of hay loading machines that we need not on this occasion repeat what must be familiar to every reader of the SCIENTIFIC AMERICAN. In the machine under consideration we recognize the embodiment of a principle, which we long ago predicted would ultimately be adopted in machines of this class; namely, the continuous gathering up and transfer of the hay to the load by means of endless belts and an apron extending upward somewhat higher than the top of the load.

In the machine before us we perceive a development of this crude idea, which has always seemed to us the most promising of all mechanical appliances for this purpose. The arrangement of parts is simple and free from complications, and the mechanical expert will readily understand the action of the machine without verbal description. We shall, however, in behalf of those not accustomed to the analysis of machinery give an explanation of the details and the operation of the machine.

To the back axletree of any common farm wagon is connected the pole, A, of the hay raker and loader. This pole is attached to the axletree, B, of the machine. The pole is firmly braced back to the axletree, and upward to support the inclined frame, C, of the machine. Upon the axletree, B, are placed driving wheels, D, which actuate the pinions, E. These pinions are attached to a shaft running in bearings supported from the framework, C, and through ratchets and pawls, they actuate the rag-wheels, F, whenever the machine moves forward, but allow them to cease their revolution in backing the machine. Endless chains, G, passing over the pulleys, H, are impelled by the rag-wheels, F. To these endless chain bands are attached, at proper and equal intervals, rakes which collect the hay and draw it up along the inclined wood framework until it reaches the top cross-bar, when it falls off the rakes upon the load, where it is received and arranged by a workman in the usual manner.



WILLARD'S HAY RAKER AND LOADER.

It will be noticed that instead of being toothed, the driving wheels have their rims perforated, which prevents clogging by dirt, as the teeth of the pinions, E, punch them out at each revolution.

In operation the horses attached to the wagon are driven so that the winrow or swath lies between them and passes under the wagon between the wheels, so that the rakes continuously gather the hay and pass it up the inclined frame as described above. When the load is obtained, the machine may be disconnected and the load conveyed to the barn or stack, leaving the machine in the right place to commence loading upon the return of the wagon.

We are informed that this machine has been thoroughly tested during two haying seasons, and has been found to work excellently, and that it has shown itself capable of loading fifty tuns of hay from the winrow in five hours.

With such rapidity we should think it would be necessary to have more than one man to distribute the hay upon the wagon so as to form a proper load, but the inventor informs us that one active man can do this part of the work. A machine of this kind capable of such rapid work must greatly facilitate the securing, in good order, of a hay crop.

Patents bearing date August 21, 1866, and October 15, 1869, have been secured through the Scientific American Patent Agency, by Hosea Willard, of Vergennes, Vt., who will dispose of territory to manufacturers, and who may be addressed for further particulars.

A Final Zoic Catastrophe.

There are chemical changes now active on the earth's surface, whose continuance must inevitably bring about the final extinction of man, and ultimately that of all other life upon our planet.

What furnishes the actual fundamental chemical nutriment or pabulum of vital existence? No chemist will contradict, when I say that it is the carbonic acid of the atmosphere. How long is this going to last? There is one mode of consumption, active and continous, which will ultimately exhaust the air of its carbonic acid, and thus put an end to organic life. This agency is itself due to vital influences. It is that by which marine animals with calcareous shells or skeletons secrete carbonates from the ocean water, the carbonic acid of these carbonates having been originally derived from the atmosphere. Such carbonic acid thus passes into solid forms, permanent and forever unavailable thereafter. This is where the great machine runs down, and Affinity obtains its final victory over its mysterious antagonist, Vitality.

Whenever the last molecule of carbonic acid produced from the combustion of all the carbon on the earth shall have been locked up in this shape, no form of life now known to us can any longer be possible, and the present Zoic Cycle must end. Comparatively and geologically speaking, the end is near; though millions of years may yet intervene. But long before this end of *all* life, the atmosphere must gradually diminish in its capacity to produce food suitable for man. Man, by burning up the carbon stored in eras past in the earth's *viscera*, is doing his utmost to preserve the status of the machine, possibly even partially and temporarily *rewinding* it; but it must still continuously run down. In the oceanic depths, this precious constituent of the air is continually undergoing

A sea-change
Into something rich and strange,"

Never to reappear in form available to life, until indeed that time shall arrive when "the elements shall melt with fervent heat;" and, when, under the influence of this heat, the calcic and magnesic carbonates shall be converted into igneous silicates, rendering up again the treasure of carbonic acid in their marble grasp, the atmospheric oxygen, representative of Affinity, enemy of Vitality, shall also then be at least partially withdrawn by oxidation of sulphides and of ferrous oxide; and the earth be thus far advanced in preparation for a new Zoic Cycle.
—*Pof. H. Wurtz.*

EDITORIAL COURTESY.—D.D.T. Moore, the enterprising publisher of the *Rural New Yorker*, gave an elegant entertainment to members of the press, at his residence on Fifth avenue, on Wednesday evening, the 2d inst. The floral display was extensive, the music fine the table bountiful with fat "wine on the lees." A large variety of delicious fruits was served, all of home production —oranges from Florida, apples from Kansas, grapes from New York, and so on. Thus nearly every State contributed to the entertainment, which seemed to be enjoyed by all present

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THE ATTAINMENT OF BEAUTY IN COMMONPLACE HANDIWORK.

Is there any real advantage in having all that surrounds us beautiful, so far as may be, consistently with other requirements? Is man any the better or happier for cultivating the sense of the beautiful and gratifying that sense within reasonable limits? There have not been wanting those who have answered these inquiries with an emphatic "no," and who have even gone so far as to assert that all mere gratifications of sense are snares of the devil, to be shunned by all such as would keep their hearts pure and aspire to a better life hereafter.

On the contrary, there have been a large class of philosophers who have no less sincerely believed that the love of beauty in nature and art has a refining and elevating influence upon the mind and soul of man; and that its indulgence tends to draw him nearer to the great Author of all good, which term includes beauty. Whatever is beautiful, say these philosophers is so far good. To love and admire beauty is therefore to love and admire goodness; and therefore the man whose heart delights in the beautiful is so much the better for it. This belief we hold, and we therefore maintain that a proper attention to the attainment of the beautiful in every work of his hands is a duty which every man owes not only to himself but to others.

Most men feel themselves impelled to do something towards the adornment of any kind of handiwork, no matter how humble or simple it may be; but as the sense of the beautiful is, in the vast majority of minds, very imperfectly developed, their attempts too frequently rather result in forms and colors repulsive to a refined and cultivated taste.

The really beautiful is only attainable through patient cultivation of taste. How then can ordinary mechanics whose time is mostly occupied in toil, and whose daily walk is among rude rather than graceful forms, ever attain such cultivation? This is a question which we find it quite difficult to answer satisfactorily. In France where—going or coming—every workman can scarcely fail to see and be impressed with some form of beauty, the art sense has become so highly developed in all classes of people, that the designs of French workmen and work-women, find ready acceptance in any market of the civilized world; and that country unquestionably now stands at the head of all nations in the arts of design.

There is always a singular appropriateness in French designs. You feel even while you are looking upon the box from which you eat your Paris *bon-bons* that the ornament on it is just the right thing in the right place.

While the art sense is so highly developed in the French mind, it manifests itself very faintly indeed in the American mind. The large majority of all designers, decorative artists, and makers of fancy and ornamental wares in this country are of foreign extraction. These facts will not be disputed, and therefore need no argument; but that we, with so few objects of taste to which our workmen can have daily access, are ever to elevate the taste of our working classes, seems, to say the least, problematical. New York, the Paris of America, has it is true done something which will tend to produce this desirable result. Her magnificent Central Park, to which working-men and working-women have free access, contains much that cannot fail to appeal to the artistic sense of the rudest workman. A small art collection exists in the Cooper Union building, which may be visited in hours of leisure by mechanics. The last twenty years have added much to the architectural beauty of the city. But beyond this all that is likely to cultivate the taste of working people is what may be seen in the shop windows. We have no magnificent art collections, to which artizans may have free access, and the metropolis is yet poor in the public art wealth which enriches all parts of the French capital.

Still, in the absence of such collections of art as may be found in the old world cities, it seems we might do something to stimulate the growth of a feeling for art. It does not seem essential that costly statues or paintings should be accessible, in order that such ideas of art as would be useful in handicraft may be obtained. Copies of rich and elegant designs in the various departments of the mechanic arts might be collected at a comparatively small expense, which would not only be very interesting and attractive, but very instructive to inspect and study. Such a collection would be a valuable, useful, and honorable addition to the facilities which private benevolence has bestowed upon the city for the instruction and improvement of the working classes.

It is to be hoped that some steps will ere long be taken to secure such collections, in all the principal cities of the United States, and to make them accessible at such hours as workmen are at leisure. They could be made made without very great cost, and certainly would greatly tend to improve all classes of mechanics, especially such as are engaged in those arts that require superior taste and appreciation of beautful forms and combinations of color.

TECHNICAL EDUCATION IN THE UNITED STATES—THE SHEFFIELD SCIENTIFC SCHOOL OF YALE COLLEGE.

The importance of scientific and technical education is generally acknowledged both in this country and in Europe. Old systems have been forced to yield in some measure to the current of popular opinion, and at the present time there are quite a number of scientific and technical schools established in various parts of the country.

It is no fault of these schools that the common school instruction has not as yet been modified to fully accord with modern views on this subject. It is doubtless the proper purpose of common school instruction to supply a knowledge of reading, writing, and arithmetic, with an outline of grammar and geography. These simple and homely tools, especially the three first, are all important to subsequent success in business or study. But they are by no means the only benefits which the common school should afford.

A mind trained to habits of minute and accurate observation, and to the analysis of things and events, is of more importance than a knowledge of either or all of the elementary branches now taught. With a mind so trained, a knowledge of whatever is necessary to future progress, not only can be, but *will be* obtained. We hazard the opinion that no youth possessing this quality of mind in a high degree, combined with physical health, ever failed to rise above the common level in the respect of his acquirements.

But while the pupil is mastering the elements of reading, writing, arithmetic, etc., his faculties of observation and analysis may not only be cultivated, but in so far as they are cultivated, in so far will his progress in any and all branches of study be facilitated. It is foreign to our purpose to elaborate arguments to substantiate this proposition. It will, undoubtedly, be confirmed by the opinions of all those who have attained eminence as instructors, or who have made the human mind the subject of careful study.

If this be a fact—and if, as we believe, the presentation of natural objects to the eyes and minds of pupils for inspection and minute examination, be the best and most natural means of cultivating the power and habit of observation—it follows that this sort of training cannot be begun too early or persevered in too long. The place then for the commencement of natural science teaching is the common school; the place for its continuance and more extended employment is the high, or grammar school, and the college and university should only complete it so far as aid of special appliances and instructors are concerned. A graduate thus trained will not only be competent but disposed to continue his progress without special aids other than those which he can himself supply.

The subject of technical education in all its bearings is one that cannot be discussed in brief. Our present purpose is to show that while we have a number of institutions specially set apart for scientific instruction of the most thorough kind, and fitted out with the most improved apparatus, and with ample collections of specimens to facilitate study, they are some of them even thus early languishing, because, through the inattention to early scientific training, the tastes of a majority of our young men and women are turned to other pursuits.

The scientific schools which seem to prosper most are those which devote themselves to special departments, as engineering or mining, or both. Some of those intended to furnish facilities for the pursuit of all departments of scientific study, can hardly yet stand alone. The reason for this is that the large corps of professors necessary to conduct the several departments require for their support more than can be realized from the tuition of the students and the income from their endowments. Institutions so situated are troubled to retain the proper talent in the different professorships, and the grade of ability would be speedily lowered, were it not that in some notable cases, there have been found able men willing to forego positions of honor and emolument rather than to see the cause of sound scientific education suffer.

Such a case is presented in the present condition of the Sheffield Scientific School, at Yale College. This school is intended to provide a special professional training for the engineer, chemist, naturalist, etc. Through the gifts of various liberal donors it is possessed of an endowment of $420,000. The corps of professors is large, and the apparatus, building, etc., have been much enlarged since the erection of the first structure—Sheffield Hall, so called from the founder of the school, Mr. Joseph E. Sheffield, of New Haven.

An effort is now making to increase the endowment of the school by $250,000, in order, as the committee state in their circular letter, "to perfect their plans for giving a college training based on modern studies for modern avocations." They further state that "they do not propose to employ any paid agency, or to use any personal pressure in securing this amount, but they ask the influence and aid of all who think that the country will be benefited by the maintenance of this undertaking. The sums now collected will not go into 'bricks and mortar' but will be permanently held as an Instruction Fund to carry on and improve the education now given."

The committee are Professors Daniel C. Gilman, Geo. J. Brush, and Chester S. Lyman. We sincerely hope that their appeal to the generous friends of "Good old Yale" and the friends of education everywhere in America, may result in securing the full amount required to carry out the plans of the institution they represent.

REPORT OF THE COMMISSIONER OF PATENTS FOR THE YEAR 1869.

UNITED STATES PATENT OFFICE,
January 27, 1870.

SIR:—In accordance with the act of March 3, 1837, which requires the Commissioner "to lay before Congress in the month of January, annually, such information of the state and condition of the Patent Office as may be useful to Congress or to the public," I have the honor to submit the following report of the business of this office during the year 1869.

The receipts and expenditures for the year, and the condition of the balance in the treasury, standing to the credit of the patent fund at its close, are shown in the following statements:

NO. 1.

No. of applications for patents during the year 1869		19,271
No. of patents issued, including reissues and designs		13,986
No. of applications for extensions of patents		153
No. of patents extended		108
No. of caveats filed during the year		3,624
No. of patents expired during the year		2,083
No. of patents allowed, but not issued for want of final fee		997
Of the patents granted, there were to citizens of the United States	13,442	
Subjects of Great Britain	294	
Subjects of the French Empire	91	
Subjects of other foreign governments	159	
		13,986

NO. 2.—STATEMENT OF MONEY RECEIVED DURING THE YEAR 1869.

Amount received for applications, caveats, etc	$632,700·65
Amount recived for copies and for recording assignments	60,445·16
Total	$693,145·81

NO. 3.—STATEMENT OF EXPENDITURES FROM THE PATENT OFFICE FUND FOR 1869.

Cash paid for salaries and for miscellaneous contingent expenses	$486,430·74

NO. 4.

Amount to the credit of the patent fund January 1, 1869	$324,330·57
Excess of receipts over expenditures during the year 1869	206,715·07
Leaving a balance on the 1st of January, 1870, of	$531,045·64

NO. 5.—STATEMENT SHOWING THE BUSINESS OF THE OFFICE FOR THIRTY-THREE YEARS, FROM 1837 TO 1869, INCLUSIVE.

YEARS.	Applications filed.	Caveats filed.	Patents issued.	Cash received.	Cash expended.
1837	——	——	435	$29,289·08	$33,506·93
1838	——	——	520	42,123·54	37,402·10
1839	——	——	425	37,260·00	34,543·51
1840	765	228	473	38,056·51	39,020·67
1841	847	312	495	40,413·01	52,666·87
1842	761	391	517	36,505·68	31,241·48
1843	819	315	531	35,315·81	30,776·96
1844	1,045	380	502	42,509·26	36,244·73
1845	1,246	452	502	51,076·14	39,395·65
1846	1,272	448	619	50,264·16	46,158·71
1847	1,531	553	572	63,111·19	41,878·35
1848	1,628	607	660	67,576·69	58,905·84
1849	1,955	595	1,070	80,752·78	77,716·44
1850	2,193	669	995	86,927·05	80,100·95
1851	2,258	760	869	95,738·61	86,916·93
1852	2,639	996	1,020	112,656·34	95,916·91
1853	2,673	901	958	121,527·45	132,869·33
1854	3,324	868	1,902	168,789·84	167,146·32
1855	4,435	906	2,024	216,459·35	179,540·33
1856	4,960	1,024	2,502	192,588·02	199,931·02
1857	4,771	1,010	2,910	196,132·01	211,582·09
1858	5,364	948	3,710	203,716·16	193,193·74
1859	6,225	1,097	4,538	246,942·15	210,278·41
1860	7,653	1,084	4,819	256,352·59	252,830·80
1861	4,643	700	3,340	137,354·44	231,491·91
1862	5,038	824	3,521	215,751·99	182,810·39
1863	6,014	787	4,170	195,503·29	189,414·14
1864	6,932	1,063	5,020	240,919·98	229,868·00
1865	10,664	1,937	6,616	348,791·84	274,199·84
1866	15,269	2,723	9,450	495,665·38	361,724·28
1867	21,276	3,597	13,015	646,581·92	639,263·32
1868	24,420	3,705	13,378	681,565·86	628,679·77
1869	19,271	3,624	13,986	693,145·81	486,430·73

It will thus be seen that, with average receipts and expenditures not greatly varying from those of the past year, the net income of the office will be about $200,000 per annum; and that there is now standing to the credit of the patent fund a balance of over $530,000.

This fact should be borne in mind in connection with any suggestions relating to increase of salaries, or facilities for performing the work of the office.

The Patent Office earns all the money which it expends, or proposes to expend; and as the inventors give, in the form of useful invention, quite as much as they receive by way of protection; as they are, moreover, taxed as citizens, as manufacturers, and as vendors of their patents and inventions, it would seem to be unjust to tax them again, in the form of additional fees, for the support of the Government or the payment of the national debt.

The patentee does not pay these fees as a compensation for the exclusive privilege which he receives. For that, he makes a full disclosure of his invention, for the future benefit of the nation. The fees are intended solely to pay the necessary expenses incurred in the examination of the invention and in the issue of the patent. In all other countries, the fund derived from the patent fees is applied to the advancement of science The fees which are paid in this coun-

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try are less than in any other, but if they are more than is needed for the expenses of the Patent Office, as at present organized, it is but fair, either that the fee should be reduced, or that the balance should be employed in such increase of the force of the office, or in providing such publications and appliances, as may increase the ease, thoroughness, and efficiency of the work of examination.

INVENTIONS IN SOUTHERN STATES.

One of the most gratifying results of the restoration of peace and of the introduction of a new system of labor in the South, is found in the increase of applications for patents from that part of the country. During the past year forty-six patents were granted to citizens of Alabama, eleven to those of Arkansas, five to Florida, sixty-eight to Georgia, eighty-six to Louisiana, fifty-three to Mississippi, forty-four to North Carolina, twenty-four to South Carolina, sixty-nine to Tennessee, forty-four to Texas, eighty-six to Virginia, and thirty-seven to West Virginia.

In the class of agriculture, the examiner reports that "in 1859 the number of applications from the South, as compared with those from the North, was less than two and a half per cent of the whole number. In 1869 the number of applications from the South was increased to over twenty-three per cent of all the cases in my class."

What the Pacific Slope and the Great Basin are doing in the way of invention may be inferred from the fact that in 1869 there were granted two hundred and sixty-six patents to California, thirty-nine to Oregon, four to Nevada, two to Washington, ten to Colorado, three to Dakota, one to Idaho, one to Montana, and two to Utah.

GROWTH OF THE PATENT OFFICE.

Few persons realize the rapid growth of the office, and the annual accretion of material. The models increase at the rate of one hundred square feet per week, or five thousand square feet per annum. The drawings increase at the rate of seventy-two cubic feet per annum; the files at the rate of four hundred cubic feet; the printed specifications at the rate of four hundred and twenty-five cubic feet; the printed drawings at the rate of four hundred cubic feet; the books in the library at the rate of one hundred and sixty lineal feet of shelving; and the copyright books at the rate of one hundred lineal feet. There will be twenty thousand more cases to be examined this year; and, if the applications made in the present year should not exceed those of 1869, they will still add, with models and drawings, twenty thousand new cases to be inspected by the examiners of future years.

It must soon become a serious question to determine what disposition is to be made of the models. In a vast number of cases no such illustration is required, the inventions are so simple that they can be readily understood by good drawings. Models soon become broken and inoperative, and in some cases have been altered surreptitiously, so as to become false witnesses.

We may take just pride in our national museum of the mechanic arts, but it is questionable whether this museum can be allowed to grow at the rate of five thousand square feet per annum.

A remedy for the difficulty will probably eventually be found in dispensing with all models, except when, in the discretion of the Commissioner, such mode of illustration is absolutely necessary. This would relieve inventors of a very considerable tax, as the preparation of the model is usually the most costly part of the application.

It is also a question for serious consideration, whether the rejected applications should be used as references to defeat new applications. Many cases have been rejected because the devices were impracticable and useless, or because they in turn were anticipated by others. Since their rejection these cases have been kept in pigeon-holes not open to public inspection. The public has taken nothing by the description of the alleged invention, and probably in the great majority of cases the manufacture of the article has never been commenced. Such mere descriptions or sketches of an invention not reduced to practice or made accessible to the public, but kept in the library of a private person, would not destroy a patent. It is not perceived that they should have this effect because the pigeon-hole in which they are entombed is in the Patent Office, rather than elsewhere.

To reject applications upon patented or published cases and pending applications only, would probably protect the public from real injury as well as by the present system, while it would diminish the labor of the office in the work of examination fully one third.

Otherwise, although the number of applications to be examined be the same from year to year, the work of the examiner is constantly increasing, since each year's accumulations are added to his portfolios. A gradual increase of the examining corps from year to year becomes, therefore, absolutely necessary.

QUALIFICATION OF EXAMINERS.

Although ample means are provided for the correction of an erroneous decision of an examiner, when adverse to the grant of letters patent, there is no check to his action, when favorable to the applicant, except the general authority lodged in the Commissioner. But it is impossible to revise the cases that are passed for issue except in special instances. It becomes very important, therefore, to secure competent men for positions of such responsibility. An examiner should be a man of great patience, industry, and honesty, of varied and yet thorough mechanical and scientific attainments, with a good knowledge of patent law, and a mind capable of the nicest discrimination. Though many men offer themselves for the position, but few are fit to fill it. As a rule, it is entirely safe to say, that no man should be appointed a principal examiner who has not served as assistant, thus becoming thoroughly conversant with the practice of the office, and demonstrating his capacity. But the demand for qualification does not apply to examiners only. So numerous are the applications for patents that assistant examiners, and even examiners' clerks, are charged with a portion of the duty of examination, as soon as it is possible thus to employ them.

Other clerical positions in the office require in the incumbents a knowledge of the different classes and machines, that many men do not possess, although they may be otherwise competent as clerks.

It is obvious, therefore, that the ordinary rules regulating the appointment of clerks in other bureaus, cannot safely be followed in this.

COMPETITIVE EXAMINATIONS.

These considerations have led to the adoption of competitive examinations as the basis of nominations for office. It may be conceded that, by this method, in exceptional cases, a competent man may be kept out of office, but an incompetent one can very rarely come in. To lessen the chances of error, great care has been taken in adapting the examination to the work to be done, so that theory and practice must both be combined to achieve the highest measure of success. Two of these competitive examinations have been held for the position of second assistant examiner. At the first, seventeen candidates were present; at the second, twenty-four. As an illustration of the working of the system, the following table will show the antecedents of the four candidates who stood at the head of the list at each examination. From this it will be seen that the young and old, the practical and theoretical, those in and those out of the office, are very fairly represented:

FIRST EXAMINATION.

No.	Age.	Education.	Practical experience.	Army or Navy service.	Previous office service.
1	22	High school.	3½ years machinist.	None.	1 month.
2	50	Collegiate.	32 years engineer.	8 years.	21 months.
3	20	Collegiate.	2 years cabinet mak'r.	None.	2 months.
4	28	Academical.	8 years printer.	2½ years.	2 years.

SECOND EXAMINATION.

No.	Age.	Education.	Practical experience.	Army or Navy service.	Previous office service.
1	40	Collegiate.	5 years.	None.	None.
2	31	Common school.	None.	2½ years.	2½ years.
3	37	Collegiate.	None.	1 year.	2 months.
4	33	Collegiate.	Leather manufactory 6 months.	None.	None.

To secure impartiality the examination was conducted by persons who had but slight acquaintance with the candidates, the latter being known only by private marks.

One hundred questions were put, copies of which were furnished to each candidate. The answers were in writing, and they were examined and marked, and the relative averages made up before the names of the candidates and their work were identified.

The list furnished by these examinations has been used in supplying such vacancies as have occurred, and the result upon the office at large, and especially as shown in the character and capacity of new employes, has been most gratifying.

THE AMERICAN SYSTEM.

Letters patent for invention in this country are in the nature of a contract between the public and the original and first inventor, whereby he receives the exclusive privilege of exercising his invention for a limited time, as a compensation for his time, ingenuity, and expense in perfecting the invention and reducing it to practice; for the communication of it to the public, and for their right to use it freely when the exclusive right of the patentee expires.

An invention is property of the highest order. Whatever may be said of the right which man may acquire in the soil, by his occupancy of it, or in the materials with which he works, or in the profits of his barter, it would seem to be a self-evident proposition that he is the owner of that which he creates; and that when his ideas, no longer vague or dreamy speculations, have taken useful form and been reduced to practice, not the abstract ideas, but the concrete and embodied principles are his own, to dispose of as he will.

As it is impossible to pay for useful inventions in money, we pay in time, which the inventor must turn into money if he can.

To insure the fairness of this transaction, under the patent laws of the United States, an examination is made into the novelty of the invention prior to the granting of the patent. This investigation includes an examination of the patents already granted, of the applications rejected, of the foreign patents, printed copies of which are furnished to us, and of the text books and cyclopedias. In making the examination reliance is placed for the most part upon the drawings; the text and models being resorted to only where the drawings are obscure and need further explanation.

As nearly one hundred thousand patents have been granted, and fifty thousand applications have been rejected, in this country alone, it is manifest that this examination is not an easy task. It would be impossible to make it without a careful classification of the subjects of invention, and without the assistance of trained and skillful examiners. With these appliances it is for the most part accurately made at a cost of only fifteen dollars for each application.

I do not hesitate to say that such an examination made by skilled, sworn, and impartial experts is more thorough and satisfactory than it would be, if made at much greater cost, by solicitors, who made it in the interest of their clients.

Accordingly, the history of patent litigation will prove that but few patents have been held to be void by reason of the existence of prior inventions, the knowledge of which was beyond the reach of the Patent Office. The great source of litigation is the conflict upon the issue of infringement, or the effort on the part of the inventor to carry the patent beyond the limits assigned to it by the office at the time of its issue.

However good the patents may be, as representing an invention of undoubted novelty and technical utility, doubtless many of the inventions covered by them prove worthless upon practical test. The number of useless inventions is, however, much less than is commonly supposed.

Our patent laws have proved such a stimulus to invention, and have fostered so many valuable improvements, that we can well afford to patent some trash. A patent for a useless contrivance does but little harm, if it carefully defines the invention, since men will neither use nor steal that which is good for nothing. It must, however, be borne in mind that many good inventions are not developed for want of means, and many are laid aside because, although good and useful, and in advance in the art to which they belong, others, their cotemporaries, are so much better and cheaper that they catch the public eye and secure the market.

Whenever the need of a new invention is suggested, the Patent Office is inundated with the applications of those who attempt to supply the demand. Some of these are crude, but suggestive of improvements, and very many are useful. Some few, however, in each class will prove to be the best and cheapest, and these alone will come into notice to the exclusion of others. The protection afforded by the patent and the hope of reward have proved the incentives to invention, and the public, enabled to choose from many devices, obtains the best thing.

Of course the larger number of patents now granted are for improvements, and for new combinations. Some of these are doubtless trivial, while many are of real benefit. The issue of patents for mere technical combinations is mainly due to the present system of patent soliciting.

Where establishments are organized for the purpose of procuring patents, they are apt to become more solicitous about the number than the quality of those which they obtain. This tendency is aggravated by those who solicit patents upon contingent fees, or who, without special training or qualifications, adopt this business as an incident to a claim agency, and press for patents as they press for back pay and pensions. Such men are often more desirous of obtaining a patent of any kind and by any means than they are of obtaining one which shall be of any value to their clients. Inventors are often poor, uneducated, and lacking in legal knowledge. They desire a cheap solicitor, and do not know how to choose a good one. They are pleased with the parchment and the seal, and are not themselves able to judge of the scope or value of the grant. Honest and skillful solicitors, with a thorough knowledge of the practice of the office and of patent law, and who are able and willing to advise their clients as to the exact value of the patents which they can obtain for them, may be of much service to inventors. There are many such, but those who care for nothing but to give them something called a patent, that they may secure their own fee, have in too many instances proved a curse. To get rid of their client and of trouble, they have sometimes been content to take less than he was entitled to, while in many cases they have, with much self-laudation, presented him with the shadow, when the substance was beyond his reach. Between such men and the office the strife is constant. They have the ear of their client, and, to some extent, of the public, and much of the misrepresentation of the spirit and character of the work of the office is directly traceable to this source. It must be said, however, in justice to attorneys, that many inventors are so foolish as to wish to obtain patents for trading purposes, or as a salve to wounded expectations, even when they know that the grant covers nothing of value unless it be combinations which, if never made before, are never likely to be made again, even by themselves.

REGISTRATION SYSTEM.

The patent system in vogue in Europe is substantially one of registration. Patents are granted upon the application of the inventor, without examination into the novelty or utility of the invention. The responsibility is thrown upon him of so framing his specification and claims that they will bear the test of subsequent investigation. This he does at his peril; and if he attempts to make any preliminary examination into the state of the art, he can do it only by the aid of solicitors, whose charges are far greater than the fees for a similar service would be if the work were done by sworn officers. But, although no examination is made, the patent fees abroad exceed those which the inventor pays in this country. This will appear from the following table:

COUNTRIES.	Duration of patent.	Fees.
United States	17 years	$ 35
Great Britain	14 years	875
France	15 years	300
Russia	10 years	450
Italy	15 years	250
Bavaria	15 years	115
Austria	15 years	350
Belgium	20 years	420
Prussia	15 years	100

That the foreign plan is inferior to what I have called the "American system" of examination, will appear from the following considerations: During the year 1869, 19,271 applications were filed in the United States Patent Office. Of these, 5,285 were rejected finally, and no patents were granted upon them. These constitute about twenty-eight per cent of the whole number. By the English or foreign system, all of these rejected applications would have become patents, and 5,285 worthless patents would have been foisted upon the country. But this is not all. Of the 13,986 patents which were actually issued, about 12,500 were rejected in the first instance, and were only finally allowed after material modifications of the specifications or claims. By far the greater part of these modifications were in the nature of limitations

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of claims, which would otherwise have been too broad. In other words, the applicants for 12,500 of the patents issued during the past year originally claimed too much, and were required to abate their pretensions before the grant was made. If the patents had been issued as they asked for them, they would have deceived the public as to the scope of the inventions and the state of the art.

It may be safely asserted that the large majority of the patents issued from the Patent Office are good and valid; and, if rightly read and properly construed, fairly represent the status of the inventions in the arts to which they relate, so that no one who adopts ordinary precautions need be deceived by them as to the character of the inventions patented. It is a testimony to the thoroughness of the examinations, and to the public appreciation of them that while no man would buy a lot of land at any price without an examination of the title by competent counsel, thousands of dollars are freely invested in patents upon mere verbal representations, and with scarcely a reading of the document. That much loss has been the result of this easy-going confidence may be asserted, but very few such losses occur which ordinary prudence and business sagacity might not have prevented.

Under the foreign system, however, neither patentee nor public can have any confidence in the patent, however carefully it may be construed or scanned. It represents nothing more than the "guess" of the inventor as to what his invention may be, unsupported by any investigation or adjudication whatsoever. It is sometimes said that no patent can be known to be valid until tested by litigation, and that, therefore, a registered patent is as good before litigation as one granted upon examination. To this it might well be answered that frequently neither a first nor a second suit fully develops the state of the art or confers a fixed validity upon a patent. It may also be asserted that the machinery of the courts is not as good for the examination of mechanical questions as that of the Patent Office. A more conclusive answer is, that, by the system of examination, one third of the applications are not patented at all, and the remainder are so winnowed from the chaff of false claims that they are necessarily better than if issued as originally presented. Every process of examination ompels the supposed invention to assume, to some extent, its proper place in the art, and, to that extent, adds validity to the patent that has passed its ordeal.

Indeed the lack of this examination and the practice of granting patents to the first introducer, as well as to the first inventor of a new improvement, has led to a movement abroad against the whole patent systsm. Its enemies clamor for its abolition. Its friends demand that it be improved, and the improvement which they suggest is the adoption of the American system. One or two smaller powers have declared against protection by patents; not so much, it would seem, to destroy the monopoly of their own inventions as to obtain the free use of those made by their neighbors. In the abolition of patents this nation, which during the last year patented more inventions than all of the rest of the world put together, would of necessity be the greatest loser. It would not give much more than it could receive in exchange.

I doubt if any one can seriously advocate or desire a change of our system, unless it be disappointed applicants, who would rather have bad patents than none, their counsel, who share in their disappointment, and such patent solicitors as hope to increase their fees by making for the inventor, at much cost of fees, that examination which the office now makes for the moderate charge of fifteen dollars.

A system of registration is, however, at present, practically impossible. It would be a simple outrage upon inventors and the public if either were prevented from making any examination whatever into the state of the art prior or subsequent to the grant of the patent. Until the drawings are printed or copied so as to be made accessible to the public, this can never be done. This subject is, however, considered elsewhere.

APPEALS.

In the infancy of the office and of the patent law, when the force consisted of the Commissioner and one "examining clerk," and when all examinations were supposed to be made by the Commissioner or under his eye, an appeal was provided in certain cases to a board of examiners or experts, to be appointed by the Secretary of State, as occasion required. Subsequently, the Chief Justice of the District Court, and, at a later period, the associate justices, were vested with the powers and duties of the board of examiners. It is supposed that the justices of the Supreme Court of the District of Columbia have succeeded to the functions of the former judges. It was further provided that upon each appeal a fee of twenty-five dollars should be paid from the patent fund to the judge to whom the appeal was taken. As this was the only appeal allowed to an applicant from an adverse decision, either within or without the office, there may have been, originally, some propriety in its institution.

By the act of March 2, 1861, however, it is provided that each case shall be twice examined by the primary examiner; that from him an appeal may be taken to a board of examiners-in-chief, and from them to the Commissioner in person. A fee is provided upon each of these appeals. No mention is made in this act of an appeal to the judges of the local court; and although in the schedule of fees it is said "that all laws now in force fixing the rates of the Patent Office fees to be paid are hereby repealed, and in their place the following rates are established," yet no fee is provided for the appeal from the Commissioner to the judge. It is believed that Congress intended at this time and in this way to abolish this appeal. The judges have, however, asserted their jurisdiction, and the Attorney-General has held that the appeal fee is still payable from the patent fund. This appeal is now useless and mischievous.

1. Three appeals are already provided for in every case, viz.: A second hearing before the examiner, an appeal to the examiner-in-chief, and another to the Commissioner.

2. There seems to be no propriety in a summary appeal from an executive to a judicial department; at all events, no such appeal is allowed from decisions of the Commissioners of Pensions, Internal Revenue, Land Office, Indian Affairs, or of the Comptrollers of the Treasury, notwithstanding the great pecuniary interests involved in their decisions, and the fact that in no one of those bureaus is such liberal provision made for appeals within the office as in the Patent Office.

3. As there are four judges, and the appeal may be taken to either of them, at the option of the applicant, and as there is no appeal from the individual judge to the court in banc, it has naturally resulted that the judges have made conflicting decisions, and have thus practically overruled each other, so that if this appeal was designed to secure uniformity in the administration of the patent laws, it has signally failed to do so. The nature of the provision was fatal to harmony, and this has been fully proven in its practical operation.

4. The allowance of a fee of twenty-five dollars for each appeal has a tendency to encourage appeals. When there are frequent reversals of the office, attorneys are induced to appeal from every decision; and the more frequent the appeals the larger the aggregate of fees paid to the judge. In this connection, as a simple matter of fact, it may be mentioned that during the administration of my immediate predecessor forty-two cases were appealed from him to one of the judges, and of these thirty eight were reversed and only four affirmed.

5. The tendency of such a jurisdiction is to extend itself. Accordingly the judges have every year encroached more and more upon the executive duties of the Commissioner. The law gave an appeal in a few cases. Appeals are now taken and sustained in many; until it is asserted that the judge, and not the Commissioner, is the head of the Patent Office, and that he is authorized to interfere and to overrule the Commissioner, in any order or rule which the latter may make or attempt to execute.

6. The practical working of this appeal has been so far from protecting the interests of the public, that the fact is, that those innovations in the practice of granting letters patent, of which the public have justly complained, have been forced upon the Commissioner against his protest by the decision of a judge upon appeal; thus, it has been held in one case that upon an application for a reissue of a patent, new matter might be introduced into the specification and drawings; in another case, that, upon the decision of an application for a reissue, the patent must be dated back to the date of filing (in one case four years), thus making infringers of manufacturers who were using the invention ignorantly during all the time that it was locked up in the secret archives of the office, and while it was impossible for them to know of the existence or character of the claims. In another, that an applicant who had filed an application and withdrawn it eight years before, might refile it and obtain a patent for seventeen years from the present date, although the samc thing had long since gone into public use and was incorporated in the mechanism of many subsequent inventions. In another, that a patent might be reissued by the patentee after it had been assigned to others; and in another, that he might reissue it after it had expired. Many like instances might be cited, but these specimens will serve to illustrate the mischief of the present system.

7. If it be said that these matters ought not to rest in the judgment of the Commissioner, the answer is:

a. He is selected because of his supposed familiarity with the business transacted in the Patent Office, and is, therefore, more likely to be right than the judge, who is appointed without reference to mechanical knowledge, or learing in patent law.

b. The fear that the Commissioner might err, would demand a further provision for an appeal from the judge, and so on *ad infinitum*, since both are human.

c. The Commissioner of Patents ought to be as competent to decide questions arising in the conduct of his office as are the heads of other like departments; and,

d. An appeal from the Commissioner is in fact provided, and would exist, even if the present appeal were abolished; indeed, even the decision of the judge is not final. It is provided in section 0, act of March 3, 1839, that the applicant may file a bill in equity in any circuit court, having cognizance thereof, "where patents are refused for any reason whatever, either by the Commissioners of Patents or by the Chief Justice," and the complainant may obtain a decree authorizing the Commissioner to issue the patent.

8. Nine-tenths of the cases appealed, involve mere questions of fact upon which the judgment of the primary examiner is as likely to be correct as that of the Commissioner or judge.

9. This appeal causes great delay in the determination of the rights of the parties. The office has no power to enforce a prompt decision, and causes are thus sometimes greatly protracted.

10. The office files, models, and papers are taken from the Patent Offie to the Court House, and are retained there at the pleasure of the judge. They are thus out of the reach of the office when wanted, and in some instances have never been returned.

I therefore, earnestly request that this appeal be abolished. In this, I do but repeat the recommendation of the former and present Secretaries of the Interior Department, of my predecessors in office, of the most respectable solicitors, especially those having the largest business before the office, and, as I believe, of some of the judges themselves.

DRAWINGS.

No part of the machinery of the Patent Office is of more value than the drawings. It is to these, as has been stated, that reference is made by the examiner, in order to determine the novelty of every new application. Models may be altered or broken, but the drawings remain unchanged. Under the law, the applicant furnishes one drawing for the use of the office. These are carefully preserved in portfolios where they can be readily examined. Some of these drawings have been in the office over thirty years. They are handled every day, and have become much soiled and worn; some are nearly destroyed, and all soon will be. Some provision for their reproduction *must* be made, or the present system of examination must be abandoned. Indeed, under any system, there must be something in the office by which new applicants and the public may know what drawings have been attached to the patents that have been already issued; and whether it be examined by attorneys, or by sworn officials, a single copy of a drawing will soon become worn and useless.

Besides this, as there is but one copy of the drawing in the office, it must be used upon all occasions. It is frequently taken to the examiner's room · it is taken to the room of the examiners-in-chief; it is used before the Commissioner, and must go to the appellate judge. It must be withdrawn from the portfolio whenever a copy is ordered or an applicant wishes to examine a reference.

This multiplies the chances of loss and of destruction, and, what is of more importance, it increases the risk of examination; since the very drawing which anticipates a new application and shows the alleged invention to be old, may not be in the portfolio when the examination is made.

To remedy these evils and provide against the gradual but inevitable destruction of the drawings, at least ten copies should be prepared: one for the use of the examiners; one for the record room where the specifications are kept, and where it would be accessible to the public; one for the library; two for the English Patent Office, in return for the duplicate set of printed specifications and drawings furnished to us; and five for sale, when copies are ordered.

The English, French, Italian and Belgian Governments engrave the drawings of all patents at a considerable expense, and are, in this particular, in advance of this country.

At the beginning of this present fiscal year, as no special appropriation was made for this purpose, and the necessity was so urgent, I availed myself of the general authority of the Commissioner to provide copies of the drawings, and of such sum as it was believed might be saved from the amount appropriated for contingent expenses, and entered at once upon the work of reproduction.

For ten copies of the drawings to be furnished weekly, photography appeared to offer the cheapest and surest method. A contract was made in June last, with Messrs. Peters & Rehn, upon terms advantageous to the office, and the weekly issues have been regularly photographed ever since. The quality of the copies thus produced has steadily improved as difficulties have been overcome, and the work has become more familiar; until it is now performed in the most satisfactory manner, both to the office and the public.

During the year experiments have been made in other methods of engraving and printing the drawings.

The American Photo-lithographic Company offered, if tracings were furnished, to supply, free of further cost to the Office, ten lithographed copies of each of the fourteen hundred drawings of patents granted during the month of June, 1869. This proposition was so favorable, that it was at once accepted and the work has been done in a very creditable manner.

The firm of French, Langran & Ogilive, of this city, made an offer for the drawings of May, 1869, at a nominal price, which was also accepted, and the work which has thus far been well done, is now nearly completed:

The experiments have led to the conclusion that, for a few copies for office use, photography is the cheapest process, while for a large edition either of the back drawings or of the current issues, lithography or photo-lithography must be employed. An appropriation has been asked for, to make this business of reproduction a permanent feature of the office work.

ANNUAL REPORT.

Since the year 1843, a report has been published annually, containing an alphabetical index of inventors, an index of the subjects of invention, a list of expired patents, and the claims of the patents granted during the year. In the year 1853, and since, small engraved copies of a portion of the drawings have been added to explain the claims; and of late years, it has been customary to add a very brief abstract of the specification, comprised usually in not more than four or five lines. The report was a pamphlet of a few pages in 1843; in 1867 it had swelled to four large volumes. The expense of producing it is now over two hundred thousand dollars per annum. It is true that this amount has not been paid out of the patent fund; the report has been published as a document by Congress. Nevertheless, as a portion of the expense of preparing it is borne by the office, it is proper to refer to it here.

I doubt if a sufficient advantage accrues to the country, from the publication of this report to justify the expense. Its bulk is such that it cannot be published until from eighteen months to two years after the expiration of the year in which the patents are issued. The claims are in most instances unintelligible, without the specifications, even with the aid of the abstracts and engravings; while the engravings themselves are not and cannot be copies of all the drawings, or figures accompanying the patent. A large number of patents have more than one figure, sometimes twenty. In the printed reports, one, or at most two, are given, for want of space to

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do better. Such mere sketches of the patent and drawings, in many cases, do more harm than good. They mislead the public, instead of instructing it. It is true that it is desirable for some persons to know, from time to time, what patents are granted, but the number of such persons is limited, and the knowledge, to be valuable to them, must be simultaneously with the issue of the patents. This information has, until a year ago, been supplied by certain mechanical journals. They published weekly lists of claims, until the issue increased to such an extent as to make it impossible for them to continue the practice. The office then attempted to supply this want. A weekly list of claims has been published, and furnished to subscribers, since January, 1869, at the rate of five dollars per annum. To this has since been added a pamphlet, containing the Commissioner's decisions, which is issued at intervals of from one to two months. This year these claims are being stereotyped, so that, at the close of the year, they may, with proper indexes, constitute the annual report, without the abstracts or drawings. If Congress should desire to strike off copies of these for gratuitous distribution, it could be done at small expense, scarcely exceeding one dollar per volume, whereas the present reports cost twelve dollars and a half per set. It is submitted, however, that if these lists of claims are of value to any one, they are worth the small price which the office now asks for them.

In addition to these weekly lists, I propose, as a substitute for the annual report as now published, that a sufficient number of copies of each entire specification and drawings be printed in full, and that one full set be deposited in the capital of each State, and in each large city. This would furnish nearly all the information to be obtained by a visit to the Patent Office, and would save inventors many journeys to Washington. It would enable counsel at a distance to examine references, and to obtain information, now practically inaccessible, without a personal visit, or the employment of resident counsel. To the Pacific coast, the West, South, and far Northeast, such collections would be invaluable. Each annual set would be comprised in about fifty-two volumes. A sufficient number of them for the purpose stated, and for office uses could be furnished at an annual cost not exceeding one hundred thousand dollars, or about one half the cost of the present annual report. To make such a collection complete, the back drawings and specifications of patents already issued should be published also. For this purpose, the balance already standing to the credit of the patent fund is probably sufficient.

STATUTES OF LIMITATIONS.

The courts have decided that no statute exists, limiting the time within which actions may be brought for the infringement of letters patent. The action on the case in the several States is variously limited to one, three, five, and six years. I submit that a limitation of five years, after the expiration of the patent, would be a proper provision.

Some provision is also needed limiting the time during which applications shall be permited to lie in the Patent Office, after adverse action, before the next step by way of appeal or amendment is taken. Much injury to the business of the country is likely to result from the construction lately given to the law by the judge of the supreme court of this District, by inflicting patents upon the nation for inventions which have long been in public use. This is, in effect, to create a monopoly, instead of affording encouragement to inventors.

There are hundreds of these cases in the office, many of which are being bought up upon speculation, and vigorously pressed for issue. One of these, lately filed, was withdrawn in 1851, and has now been refiled, after a lapse of nineteen years, when the substance of the invention which it seeks to monopolize has gone into use in nearly every form in which a well known agricultural implement is now manufactured.

FEMALE COPYISTS.

Prior to July 1, 1869, much of the copying of the office was done by females. About sixty-five were employed, who worked at their own homes, and who were paid at the rate of ten cents per hundred words for the amount actually copied. By an act approved March 3, 1869, provision was made for fifty-three female copyists at an annual salary of $700. As it was obvious that this force must labor within the office, in order to secure proper discipline and efficient work, six rooms were provided in the Patent Office building for the entire number. These rooms and clerks were placed under the charge of an efficient female superintendent. It soon became evident that although the number of copyists was reduced, there were still more than sufficient to do the work originally performed by the larger number. Additional work was therefore assigned to them from other divisions, and the force of male clerks was correspondingly reduced. Accurate time tables have been kept since July 1, 1869, of the attendance of these ladies, and a careful record has been made of their work.

The result of the experience of six months is that the attendance is nearly as good and the work is fully equal in quantity and quality to that of male clerks performing corresponding duties. The salaries of these ladies were originally fixed at $700 only, instead of $900. This, it is presumed, was an oversight, as they have labored as faithfully, and until November 15, 1869, one hour per day longer than the female clerks of any other department. I know of no reason why their pay should not be equal to that of male clerks of like grades, except that there are, as nearly as can be ascertained, twenty-five applications for positions by women to one from men. This division is the largest in the bureau and is under excellent discipline, yet the superintendent of it, because a female, has with difficulty been enabled to secure the pay of a first-class clerk. I recommend that the pay of the female clerks be raised to at least $900 per annum; that they be paid at that rate from the beginning of the present fiscal year; and that permanent provision be made for a female superintendent, at a salary of at least 1,400 per annum.

SALARIES.

Principal examiners are now paid $2,500 per annum, while first assistant examiners receive $1,800, and second assistants $1,600. The difference between the assistants is but $200, while between the first assistants and principals it is $700. There is not a corresponding difference in duties, qualifications, or ability. I submit that if the salaries of first assistants were fixed at $2,000 the scale would be more equitable.

The character and necessary qualifications for the examiners and chiefs of divisions require adequate compensation to secure the best men. These positions ought to be filled by permanent incumbents, and a sufficient price should be paid to retain them in office. That this is not yet done, appears from the fact, that they voluntarily resign to accept other positions or to go into business as solicitors. Every second assistant examiner now in the office, twelve of the twenty first assistants, and seven of the twenty-two principal examiners were appointed during the year 1869; of these twenty-five were appointed to fill places made vacant by voluntary resignations. In the other departments of the office, while it is doubtless true that many young unmarried men are amply paid, it is also true that experienced clerks of mature years are poorly compensated. Under the last appropriation bill not a single fourth-class clerk was assigned to the Patent Office.

If there should be any increase of salaries, I commend the employés of this office to the attention of Congress, especially as the revenue which enables the office to support itself is largely due to their faithfulness and industry.

It has been the practice, in former years, as the work of the office increased, to detail clerks to perform the work of assistant examiners, and assistants to perform the work of examiners. From time to time acts of Congress have been passed authorizing the Commissioner to pay these persons at the rate annexed to the higher positious filled by them. A bill for this purpose was before the last Congress, and was favorably reported, but failed for want of time. I am constrained to say that I doubt the expediency, as a rule, of encouraging clerks to expect increase of pay with every change in their duties. It ought to be in the power of the Commissioner to assign his force to the best advantage without incurring the obligation of increasing salaries.

The additional honor and experience ought to be some compensation for a temporary occupancy of a more advanced position. But the practice has hitherto been otherwise; my predecessors who made the assignments, accompanied them with a distinct pledge to endeavor to secure the extra compensation, and the labor was performed upon the faith of that pledge.

I, therefore, recommend that the appropriation be made, with the distinct understanding that hereafter no such advances are promised or will be given.

DISBURSING CLERK.

The large amounts of money paid into the office daily, in small sums, and the necessary pay rolls and accounts, have rendered the services of a financial clerk absolutely necessary. This officer was also formerly the disbursing clerk of the bureau, and in this capacity performed the full labor of a disbursing clerk in any other department. Nevertheless he has never received the $200 additional pay allowed by law to disbursing clerks. On the 14th of January last the Secretary of the Interior sent a communication to both houses of Congress, inclosing a claim for the payment of this sum, being the preceding year of service, and recommending the same to their favorable consideration. The letter was referred in the Senate to the Committee on Appropriations, and in the House of Representatives to the Committee on Claims, where the matter now rests.

As no officer has been more faithful in the discharge of his duties, and as those duties and the experience of the incumbent fully warrant the expenditure, I recommend that the arrears of additional compensation be paid.

Since the expenditures of this office are now provided for by special appropriation, and a financial clerk of some kind cannot be dispensed with, I can see no reason why the disbursements of the office should not also be made by him. The present system involves double labor, and affords no additional guarantee against abuse, since the accounts of any disbursing officer, either of the department or bureau, must still be audited by the Treasury Department.

ASSISTANT COMMISSIONER.

The duties devolving upon the Commissioner of Patents cannot be performed by one person. He is not only the executive head of a large bureau, but he is vested with the sole right to extend patents, and he is charged with the duty of hearing appeals from the board of examiners-in-chief. The extension cases amounted to 153 during the last year, and as more patents were granted in 1856 than in 1855, the number of applications must constantly increase. The appeal cases of all classes amount to about 200 per annum, some of them involving the consideration of vast amounts of testimony and voluminous arguments. When to this is added so much of the correspondence as he must attend to in person, applications for office, and the necessary time for interviews, it is obvious that the labors must be arduous and unremitting.

I therefore respectfully recommend that an assistant commissioner be provided for by law, to be appointed by the President, by and with the advice and consent of the Senate; such officer to perform the duties of Commissioner in the case of death, sickness, or absence; and such other duties as may be assigned to him by the Commissioner.

ROOM OVER SOUTH PORTICO.

My attention was lately called to the existence of a room over the south portico of the Patent Office building, which, when explored, proved to be a hall 90 feet long by 30 feet in width and 20 in hight. This has been hitherto practically inaccessible, as it was unfinished and useless. It has now been fitted up and rendered easy of access, at a moderate expenditure, thus affording very eligible quarters for the library of copyrights and for the copyists of drawings.

Smaller rooms exist over the other porticoes of the building, which may be profitably arranged for the reception of rejected models.

COPYRIGHTS.

Congress omitted at its last session to make any appropriation for the care of the copyrighted books and records.

I am persuaded that the time has come when a radical change should be made in the system of registering copyrights. This is now done in the clerks' offices of the various district courts. It is so imperfectly done that copyrights are proverbially worthless. They are usually invalid from a failure to comply with essential formalities; because no officer is interested to see that these formalities are complied with. The clerks omit in many cases to send their records to this office, and to transmit the books. Many of the latter are never received at all. Meanwhile Congress has been called upon from year to year to make appropriations from the funds in the treasury for the care of these books and papers. It is submitted, since mail facilities are now so cheap and abundant, that the work of registration could be done much more thoroughly in the Patent Office, and that the fees for that service (about $3,500 per annum) would pay all the expenses of the necessary clerical force, and for the custody of the books. If it were the business of a division in this office to do this work, correspondence could be maintained with authors and publishers, and copyrights could be perfected. I also ask that the Patent Office be permitted to display and use as books of reference, under proper restrictions, the books, especially those of a legal, mechanical, and scientific character, which are deposited by the authors and publishers under the law. These have been hitherto of no value whatever, except as vouchers.

TRADE-MARKS.

By conventions between the United States and France and Russia (U. S. Statutes at Large, vol. XV, p. —), provision is made for the deposit of trade-marks by citizens of either country, in the United States Patent Office, the Tribunal of Commerce of the Seine, at Paris, and the Department of Manufactures and Inland Commerce, at St. Petersburg. No fee is provided for the reception and filing of these papers. As the office labor to be performed in relation to them is analogous to that attending the filing of caveats or disclaimers, the same fee ($10) would be a proper charge.

It would also, doubtless, be a proper provision if a law were enacted giving validity to trade-marks so filed, either for an indefinite or for a limited period of time.

CONCLUSION.

In conclusion, it is right that I should say that no class of our citizens has done more for the glory and substantial prosperity of the nation than the mechanics and inventors of the United States, and yet they have never been favored children.

They do not deem it too much to ask that the Patent Office, which is the only institution which they can specially call their own, and which they have built up with their money and established by their genius, shall be supplied upon a liberal scale with every needed appliance for the performance, in the best manner, of all its legitimate duties.

I transmit herewith an alphabetical list of the patentees to whom patents have been granted during the year 1869, together with their places of residence and the subjects of their inventions, and also a list of all patents which expired during the same period.

Respectfully submitted.

SAMUEL S. FISHER, Commissioner.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

SEWING MACHINE SHIELD.—Mary W. Welty, New York city.—The object of this invention is to provide a shield attachment to sewing machines, by which the fabric to be sewed will be protected from the oil of the journals and from injury by contact with the machinery, and which will, at the same time, form an extension and continuation of the feed plate of the machine to let the fabric move smoothly over it. Heretofore several forms of shield attachments have been proposed, but the same were either secured upon or under the feed plate by projecting screws or other devices. They became thereby more of a hindrance to than support of the fabric, and fulfilled merely the object of protecting the fabric from the oil mechanism of the machinery. The present invention consists chiefly in providing ears or lugs on the front end of the shield, such ears catching under the feed plate so that they hold the shield in line with the feed plate and cause it therefore to form a smooth continuation of the latter.

PUNCH AND DIE FOR MAKING SLOTS IN METALLIC TUBES.—John Gibbs, Brooklyn, E. D., N. Y.—This invention relates to a new and useful improvement in the method of cutting slots in metal tubes, having more particular reference to the tubes or safes employed in the use of the "endless match," and consists in the use of a die and punch in combination with a partition bed and mandrel for making longitudinal slots or recesses in one or both sides of the tube for giving access to the match used. This method of cutting slots is applicable to tubes used for other purposes.

JOIST PROTECTOR.—H. Galmann and Charles Ruhe, Buchanan, Pa.—This invention relates to a new and useful improvement in a device for supporting and protecting joists in buildings, and consists in a cast-iron box support placed in the wall, which the end of the joist enters, and by which it is protected.

SPARK ARRESTER.—Edward Waud, Eugene City, Oregon.—This invention relates to a new attachment to the smoke stacks of locomotive engines, steamboats, etc., and has for its object to prevent the escape of sparks from the smoke stack. The invention consists in the arrangement of channels and conductors, whereby the ashes and sparks carried up by the draft are conducted away from the engine to one side of the same.

THATCHED ROOF.—Lionel Foster, Burlington, Iowa.—This invention relates to a new manner of fastening the straw upon the tie bars, or slats which cross and connect the rafters, and to a new mode of treating a thatched roof in order to make it entirely water-proof, and, to a great degree, fire-proof, and also to increase its durability.

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STIRRUP MACHINE.—Dempsey Forest, Mottomosa, Texas.—This invention comprises a clamping vise with pins of peculiar construction and adaptation for bending the thin wood plates or sheets around a lever former which is used by the operator to bend the blanks down into the forming recesses of the jaws and hold them until the said jaws are clamped together, and the blanks reduced to the finished form and secured to the blocks by which the suspending straps are connected.

GROOVING MACHINE.—W. G. Raoul, Independence, La.—This invention consists in an improved adjustable rotary cutter, and the arrangement of the same with a vertically and horizontally adjustable feeding table and clamping devices for holding the work to be operated on.

CAMERA SCREEN.—F. Peabody, Louisville, Ky.—This invention relates to a new and improved arrangement of screens for cameras, and consists of a circular screen made of black cloth or other suitable substance stretched on a wire, and placed on the inside of the camera box just above the inner end of the tube, and on hinges to swing up and expose the plate to the object to be taken, or down to cover the inner end of the tube.

STEP SUPPORTS FOR MILL SPINDLES.—John Russell, Prairie, Mo.—This nvention relates to improvements in the adjusting devices for the steps of mill spindles, and consists in the arrangement of the steps in the top of a vertically adjustable tube or other sliding support, provided with vertical guides and working through guide plates to insure the vertical position and to prevent rattling, the said support being mounted on a rod rising up from the bridge tree and jointed to it, so that the joint may compensate for the curve described by it due to the one end of the bridge tree being fixed and the other swinging around the said fixed point and tree step may be raised in a right line.

ELECTRIC CLOCK.—Kennedy Electric Clock Co., New York city.—These improvements have for their object the simplification of the clock, the reduction of the cost of manufacture, and the improvement of the time-keeping qualities. The clock train consists of a single wheel, and a single magnet only is employed to operate the pendulum. The friction of the parts s reduced to a minimum.

ELECTRIC CLOCK.—Elisha Wilson, New York city.—In this invention the pendulum is acted upon by an electro-magnet, which is so arranged that t cannot retard the pendulum. The pendulum is provided with a permanent magnet, which swings within an open electric coil, arranged on one side; and the circuit breaker is so placed that the electric current does not operate upon the magnet of the pendulum, until just as the latter has begun to fall on its return sweep. It is believed that this improvement will contribute essentially to the accuracy of the clock, and also prove to be economical.

CAR FARE-BOX.—W. G. Raoul, Independence, La.—This invention relates to a new and useful improvement in boxes for receiving passengers' fares on cars of street railroads, omnibuses, and other vehicles for transporting passengers.

PENCIL SHARPENER.—Jacob McClure, Nashua, N. H.—This invention relates to new and useful improvements in sharpeners for lead pencils, and consists in making the sharpener in the skeleton form, or as an open hollow cone, either square, diamond-shaped, or triangular, as may be desired, and also in the arrangement of projections or shoulders to guide the knife, and in an aperture or relief opening for the lead point of the pencil at or near the point of the sharpener.

HORSE HAY FORK.—Simeon Clark, Howard, N. Y.—This invention relates to new mechanism for operating the oscillating toes of horse hay forks.

BOOTS AND SHOES.—Samuel Babbitt, Brazil, Ind.—The object of this invention is to so construct boots and shoes that the same will be at once water-tight and warm, and that the soles will be strengthened and not apt to wear at or near the soles. The invention consists chiefly in interposing a piece of flannel or other fabric between two layers of leather which constitute the upper of the boot or shoe, and also in attaching to the main sole convex sole on which the foot may rock.

MORTISE PIECE FOR LOCKS.—Wm. Weisner, Elizabethtown, New Mexico.—This invention relates to improvements in mortise pieces for mortise locks or sliding bolts, and consists in the combination with the said mortite pieces as commonly used, of plates arranged in the mortises to close the same when the bolt is withdrawn, to present a more ornamental appearance, and to prevent the mortises from filling up with colleetions of dust and other matters.

STRAW CUTTER.—G. S. Garth, Mill Hall, Pa.—This invention relates to improvements in straw cutters, having for its object to provide an arrangement of the support of the fulcrum of the cutter lever, better adapted for holding the cutter firmly up to the steel or metal plate against which it cuts, and also for withstanding the wear; and the combination with the same of a friction or regulating plate, and thumb screw, for holding the cutter firmly up to its position, but in such a manner as not to cause too much pressure of the knife against the fixed bed or cutter.

WATER ELEVATING APPARATUS.—J. L. Garlington, Snapping Shoals, Ga.—This invention relates to improvements in apparatus for raising water from wells in buckets, by cords working over pulleys, and consists in the application to the cord between one end made fast to any support, and the pulley over which it works for raising the said bucket, of a weight or a friction pulley, arranged to run on the bight of the said cord down in the well or a chamber therein to elevate the bucket; and in the application to the weight of a cord, winding drum, and crank shaft for raising it, whereby the weight will raise the bucket in moving half the distance the bucket moves; consequently requiring only half the turning of the crank that would be required, if applied directly to the bucket.

RAMMER FOR PACKING TOBACCO.—John R. Sutton, Brooklyn, N. Y.—This invention relates to improvements in the small rammers used by tobacco packers for packing the fine tobacco into the small papers in which it is packed for retail purposes, and it consists in the application to the end of the rammer which acts on the tobacco, of a projection resembling in form, to some extent, the bowl of a pipe; also, in the application to the rammer, and for action in conjunction therewith, of a sliding pin or punch, for forcing down into the tobacco to make a hole for the stem of a pipe in such relation to the recess formed by the said projection, that when the rammer is withdrawn and before the paper is withdrawn, a smoking pipe can be conveniently packed in the paper with the tobacco.

DRAWING FRAME.—Charles Wall, New York city, and John Stewart, Brooklyn, N. Y.—This invention relates to improvements in drawing frames, for dressing manila, hemp, and other similar substanees, and consists in the combination with the endless chain combs and condensing apparatus such as commonly used for dressing the laps, and reducing the same to slivers, of a series of revolving combs working on an endless carrying apron, and dressing the hemp and delivering it in laps or bats to the said endless chain, in a way to serve as a substitute for the lap machines now used for dressing the hemp previously to being fed to the same endless chain, the said chain being arranged to move at a greater surface speed than the revolving combs, whereby it draws the hemp through the teeth of the revolving combs, and its own teeth are caused to move faster than the hemp, and a thorough and efficient combing action is produced on the same, producing better results than can be effected in the present way; and the same is accomplished in one machine and more economically, requiring only one feeding operation, and less attendance.

PRINTERS' CHAIR.—Amasa J. Finch, New York city.—This invention has for its object to furnish an improved chair for printers' use, which shall be so constructed as to allow the sitter to have as free a movement in every direction as when standing.

ORNAMENTING AND COLORING PLASTER OF PARIS AND OTHER CEMENTS. Gustave Schlueter, Brooklyn, N. Y.—The object of this improvement is to harden plaster of Paris, and also impart ornamental colors to it. The colors are mixed with the plaster in the form of dry powders; gum arabic, or other adhesive substance, also in the form of powder, is likewise added When water is mixed with the plaster thus prepared, it sets in the ususl. manner, takes on the desired color, and becomes hard and smooth, capable of receiving a fine polish.

ELASTIC LANYARD.—J. E. Jones, Waretown, N. J.—This invention has for its object to furnish an improvement in lanyards, by means of which the lanyards may be prevented from breaking when exposed to a sudden strain, which, coming suddenly upon tant ropes is liable to break them at a time when they are most needed to support the rigging of the vessel.

FEED CUTTER.—Wm. H. Rosser and James Stiver, Mill Hall, Pa.—This invention relates to a new and useful improvement in machines for cutting hay and straw, and other articles designed for feed.

DEVICE FOR CONNECTING HORSES TO VEHICLES.—Alexander Shaler, New York city.—This invention has for its object to furnish an improved device for connecting horses quickly and securely to the thills of vehicles in such a way as not to require tugs or traces, and in such a way that the horse may be instantly detached from the vehicle should he become frightened or fall.

LUBRICATOR.—Royall S. Hildreth, South Adams, Mass.—The object of this invention is to furnish a simple and cheap means for oiling or lubricating journals in all situations, and consists in the use of a spring within the oil cup in connection with an oiling wire, so arranged that the wire shall be at all times pressed against the journal in whatever position the oil cup may be placed.

LAMP EXTINGUISHER, ETC.—S. C. Catlin, Cleveland, Ohio, and A. Corbin, Ellenville, N. Y.—This invention relates to a new and useful improvement in a device for extinguishing lamps and trimming the wick, and consists in a sliding sleeve, the top end of which is a circle to serve as a guide in trimming the wick with scissors, and in a hinged extinguisher which serves as a self trimmer.

BUTTON FOR GLOVES, ETC.—John A. Spooner and John Ellerby, Brooklyn, N. Y.—This invention relates to a new self-fastening button, which is to be applied to gloves and other articles of wearing apparel, without the use of thread, and without injury to the fabric to which it is secured.

WASHING MACHINE.—Linton Wharton, Richland, Iowa.—This invention relates to improvements in washing machines, and consists in an improved arrangement of means for working a reciprocating rubbing board over a stationary board placed in a suitable box or tub.

CHURN POWER.—Theodere C. VanWyck and Wm. Kent, Poughkeepsie, N. Y.—This invention relates to improvements in powers for driving churns, sewing machines, lathes, and other light machines, and consists in the combination with a weighted drum, or it may be a clock spring device and suitable multiplying gear, of a regulating apparatus of peculiar construction.

WATER ELEVATOR.—W. G. Hamilton, Milton, Wis.—This invention relates to improvements in water elevating apparatus, whereby it is designed to simplify and improve the apparatus, patented March 2, 1869, No. 87,408, and it consists in an arrangement of the lifting spout, which receives the water from the buckets, so that it will be restored after the buckets pass by it by gravitation, thereby dispensing with all restoring apparatus.

MOLD FOR MAKING COMBINED IRON AND STEEL INGOTS.—Patrick Doyle, Newark, N. J.—This invention relates to improvements in molds for making ingots of iron and steel, in a manner to dispose the one metal on one or more sides of the other and secure a perfect union of the two, and it consists in a vertical mold of four, or other number, of plane sides, one or more of which may be detachable, and clamped to the other by strong bands, in which a strong thick plate of metal is arranged to fit near one side, from top to bottom, snugly, to occupy a part of the space when the metal of which the greater part of the ingot is to be composed is poured in, and to remain until the same has solidified sufficiently to retain its position, when it is withdrawn, having a space for the other metal, which, being poured in unites perfectly with the first and forms the required com. position ingot.

BRICK MACHINE.—H. D. Thorp and J. G. Lehr, Harlan, Ind.—This invention relates to improvements in brick machines, and consists in an improved arrangement of devices for discharging the molds after being filled from under the machine; also an improved arrangement of movable and stationary kilns in the mud mill above the paddles for facilitating the grinding and mixing; and also, an improved adjusting arrangement for raising or lowering the mold supporting table.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING FEB. 1, 1870.

Reported Officially for the Scientific American.

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99,277.—ROOFING COMPOSITION.—Thos. R. Abbott, Lowell, Mass.

99,278.—MODE OF ATTACHING HORSES TO VEHICLES.—J. K. Andrews, East Lampeter township, Pa.

99,279.—RAILWAY RAIL CHAIR.—Richard Anthony, Pittston, assignor to himself and Thomas Williams, Luzerne county, Pa. Antedated Jan. 19, 1870.

99,280.—POWDER KEG.—L. Austin and J. E. Hall, Cleveland, Ohio.

99,281.—BOOT AND SHOE.—S. Babbitt (assignor to himself and G. W. Orr), Brazil, Ind.

99,282.—SUN SHADE FOR HORSES.—E. T. Balch, Philadelphia, Pa. Antedated Jan. 20, 1870.

99,283.—SEWING MACHINE.—William Black, Hagerstown, Ind.

99,284.—TRUNK.—Thomas Bond, East Brookfield, Mass., assignor to Daniel J. Clark, W. F. Doggett, and S. M. Burr, Columbus, Ohio.

99,285.—GAS METER.—Thomas Brattan, Birkenhead, Eng., assignor to A. H. Dixson.

99,286.—SEED PLANTER.—George W. Brown, Galesburg, Ill.

99,287.—ROLLER JAW TEMPLE FOR LOOM.—W. H. Burns, Grafton, assignor to J. Luther, Worcester, Mass.

99,288.—FENCE POST.—M. K. Butterfield, Eddyville, N. Y.

99,289.—LAMP EXTINGUISHER.—S. C. Catlin, Cleveland, Ohio, and A. Corbin, Ellenville, N. Y.

99,290.—ENVELOPE MACHINE.—Henry W. Chamberlin, New York city.

99,291.—APPARATUS FOR EXTINGUISHING FIRES.—Isaac H. Clark, Boston, Mass. Antedated Jan. 20, 1870.

99,292.—HORSE HAY FORK.—Simeon Clark, Howard, N. Y.

99,293.—ANIMAL TRAP.—W. J. Clarkson, Gourdin's Depot, North-Eastern Railroad, S. C.

99,294.—FERTILIZER.—John Commins, Charleston, S. C.

99,295.—BALING PRESS.—P. K. Dederick, Greenbush, N. Y. Antedated Aug. 1, 1869.

99,296.—BALING PRESS.—P. K. Dederick, Albany, N. Y.

99,297.—BALING PRESS.—P. K. Dederick, Albany, N. Y.

99,298.—CHAIN OR BAND.—John H. Doerr, Philadelphia, Pa.

99,299.—MOLD FOR MAKING COMBINED INGOTS OF STEEL AND IRON.—Patrick Doyle, Newark, N. J.

99,300.—ELECTRO-MAGNETIC MACHINE.—A. E. Dupas, New Orleans, La.

99,301.—MEAT AND VEGETABLE CHOPPER.—S. F. Emerson, Seville, Ohio.

99,302.—PRINTERS' CHAIR.—M. J. Finch, New York city, assignor to Margaret A. C. Finch, Shellsburg, Wis.

99,303.—MACHINE FOR BENDING STIRRUPS.—Dempsey Forest, Mottomosa, Texas.

99,304.—THATCH ROOF.—Lionel Foster, Burlington, Iowa.

99,305.—JOIST PROTECTOR.—H. Galmann and Charles Ruhe, Buchanan, Pa.

99,306.—COLORING MARBLE.—Smith Gardner, New York city, assignor to the International Marble Coloring Company, New York city.

99,307.—APPARATUS FOR RAISING WATER.—J. L. Garlington, Snapping Shoals, Ga.

99,308.—STRAW CUTTER.—G. S. Garth, Mill Hall, Pa. Antedated Dec. 1, 1869.

99,309.—PUNCH AND DIE FOR PUNCHING TUBES.—John Gibbs, Brooklyn, E.D., N. Y., assignor to himself and Calvin H. Carter Waterbury, Conn.

99,310.—THRASHING MACHINE.—E. W. Griffin, Pepperell, assignor to himself and F. S. Brown, Cambridge, Mass.

99,311.—STUMP EXTRACTOR.—Albert Gummer, Omro, Wis. Antedated Jan. 29, 1870.

99,312.—CHURN.—Floyd Hamblin, Madrid Springs, N. Y.

99,313.—WATER ELEVATOR.—W. G. Hamilton, Milton, Wis.

99,314.—STREET LAMP.—J. F. Harly, Kipton Station, Ohio.

99,315.—LOCK NUT.—G. G. Heermance, Claverack, N. Y.

99,316.—CULINARY STEAMER.—J. H. Heritage, Wilmington, Del.

99,317.—BIT STOCK.—Royall S. Hildreth, South Adams, Mass.

99,318.—RAILWAY CAR REPLACER.—Horace H. Holmes, Elmira, N. Y., assignor to himself, J. D. Dale, Ira S. Beers, and J. H. Dale.

99,319.—HORSE HAY RAKE.—Charles Howard, West Hurley, N. Y.

99,320.—ELASTIC LANYARD.—J. E. Jones, Waretown, N. J.

99,321.—ELECTRIC CLOCK.—Samuel A. Kennedy, Attleborough, Pa., assignor to the Kennedy Electric Clock Co., New York city.

99,322.—BLOWING APPARATUS FOR ORGANS, ETC.—M. James Kerigan, Boston, Mass. Antedated Oct. 21, 1869.

99,323.—MACHINE FOR MOVING BOATS ON CANALS.—Wm. R King, Washington, D. C.

99,324.—COMPOSITION FOR THE MANUFACTURE OF WATER, GAS, AND DRAIN PIPES.—W. P. Kirkland, San Francisco, Cal.

99,325.—SASH HOLDER.—D. R. Kline, Allentown, Pa.

99,326.—COMPUTING ARRANGEMENT FOR WEIGHING SCALES.—H. D. Lathrop and Albert Gay, Bedford, Ohio.

99,327.—BLIND SLAT MACHINE.—F. Leclere (assignor to M Eames), Watertown, N. Y.

99,328.—STALK CUTTER.—Joel Lee, Galesburg, Ill.

99,329.—ROLLING MILL FOR ROLLING GROOVED METAL ARCHES.—W. S. Levake, Cleveland, Ohio.

99,330.—BOLT FOR DOORS.—Jacob Levy, New York city.

99,331.—HORSE HAY RAKE.—William H. Long, Eddyville, Iowa.

99,332.—COMPOSITION FOR PAINT.—Robert Love, New York city.

99,333.—VALVE AND PISTON PACKING.—Joseph Marks, Boston, Mass.

99,334.—TAG ATTACHMENT.—T. P. Marston (assignor to himself and N. M. Phillips,) New York city.

99,335.—PENCIL SHARPENER.—Jacob McClure (assignor to C. D. Copp and E. J. Copp), Nashua, N. H.

99,336.—PAPER-FOLDING MACHINE.—William Mendham, Philadelphia, Pa. Antedated Jan. 15, 1870.

99,337.—EGG BEATER.—Nathaniel C. Miller, Stroudsburg, Pa.

99,338.—PAINT BRUSH.—G. G. Morris (assignor to himself and W. W. Eastham), Boston, Mass.

99,339.—ILLUMINATOR FOR STOVES, ETC.—Benjamin Nott, Albany, N. Y.

99,340.—HARVESTER RAKE.—Aaron Palmer and Charles W Palmer, Brockport, N. Y.

99,341.—TABLE FORK.—James Patterson, San Francisco, Cal. Antedated Jan. 29, 1870.

99,342.—SELF-ACTING MULE FOR SPINNING.—Seth D. Paul, Woonsocket, R. I.

99,343.—CAMERA SCREEN.—F. Peabody, Louisville, Ky.

99,344.—LOCK.—N. Petre, New York city.

99,345.—RAILWAY CHAIR AND FISH-JOINT.—D. C. Pierce, Chicago, Ill, Antedated Jan. 24, 1870.

99,346.—RAILWAY FROG.—D. C. Pierce, Clayton, N. Y. Antedated Jan. 31, 1870.

99,347.—LADIES' SAFETY BELT.—Mary G. Porter, Charlestown, Mass.

99,348.—MACHINE FOR POLISHING MARBLE.—Edwin Price and E. B. Price, Norwalk, Conn.

99,349.—FRUIT-PRESERVING HOUSE.—Jesse Prior, Adrian, Mich.

99,350.—GROOVING MACHINE.—W. G. Raoul, Independence, La.

99,351.—FARE-BOX FOR RAILROAD CARS.—W. G. Raoul, Independence, La.

99,352.—FEED CUTTER.—Wm. H. Rosser and James Stiver, Mill Hall, Pa.

99,353.—STEP-SUPPORT FOR MILL-SPINDLES.—John Russell, Prairie, Mo.

99,354.—RAILWAY CAR JOURNAL LUBRICATOR.—Thos. Sayles, Chicago, Ill.

99,355.—COMPOSITION FOR MOLDING FROM PLASTER OF PARIS.—Gustave Schlueter, Brooklyn, N. Y.

99,356.—GEAR CUTTING MACHINE.—Wm. Sellers, Philadelphia, Pa.

99,357.—DEVICE FOR CONNECTING HORSES TO VEHICLES.—Alexander Shaler, New York city.

99,358.—FIRE-ALARM SIGNAL-BOX.—G. W. Shawk, Cleveland, Ohio, assignor to the Cleveland Fire-Alarm Company.

99,359.—APPARATUS FOR SINKING PNEUMATIC PILES.—T. E. Sickels, Kennett's Square, Pa.

99,360.—APPARATUS FOR SINKING PNEUMATIC PILES.—F. E. Sickels, Chicago, Ill.

99,361.—COTTON SEED PLANTER.—Bryan Smith, Falkland, N. C.

99,362.—GAFF-BLOCK FOR VESSELS.—C. D. Smith, Bridgeport, Conn. Antedated Jan. 20, 1870.

99,363.—WIND-WHEEL.—E. S. Smith, Macomb, Ill.

99,364.—CLOTHES WRINGER.—A. H. Spencer, Providence, R. I.

99,365.—BUTTON.—J. A. Spooner and John Ellerby, Brooklyn, N. Y.

99,366.—THRASHING MACHINE AND SEPARATOR.—Abraham Staffer and Peter Staffer, Salt Creek, Ind. Antedated Jan 29, 1870.

99,367.—MANUFACTURE OF IRON.—David Stewart, Kittanning (assignor to himself and S. M. Kier), Pittsburgh, Pa.

99,368.—MANUFACTURE OF IRON.—David Stewart, Kittanning (assignor to himself and S. M. Kier), Pittsburgh, Pa.

99,369.—RAILWAY WATER ELEVATOR.—Arthur A. Stivender, Ocala, Fla.

99,370.—RAMMER FOR PACKING TOBACCO.—John R. Sutton, Brooklyn, N. Y.

99,371.—BRICK MACHINE.—H. D. Thorp and J. G. Lehr, Harlan, Ind.

99,372.—MACHINE FOR PACKING TOBACCO.—J. H. Trowbridge, New Haven, Conn.

99,373.—DRIVEN WELL.—Isaac Trump, San Francisco, Cal.

99,374.—WATER-WHEEL.—B. W. Tuttle, Galena, Ill.

99,375.—BASE BURNING STOVE.—H. B. Van Benthuysen, Lock Haven, Pa.

99,376.—REGULATOR FOR MACHINERY.—T. C. Van Wyck and Wm. Kent, Poughkeepsie, N. Y.

99,377.—SUBSOIL PLOW.—Wm. Watkins, Joliet, Ill.

99,378.—SPARK ARRESTER.—Edward Waud, Eugene City, Oregon.

99,379.—GANG PLOW.—Samuel Welch, Belpassi, Oregon.

99,380.—SHIELD FOR SEWING MACHINES.—Mary W. Welty, New York city.

99,381.—LIGHTNING ROD.—J. D. West, New York city.

99,382.—RAILROAD SIGNAL-BOX.—E. B. Westfall (assignor to himself and Frank Thomas), Williamsport, Pa.

99,383.—WASHING MACHINE.—Linton Wharton, Richland, Iowa.

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99,384.—FIRE-PLACE GRATE.—Wm. E. Whitehurst, Norfolk, Va. Antedated Jan. 20, 1870.
99,385.—CLOTHES-LINE CLAMP.—Geo. W. Wilbar, Taunton, Mass.
99,386.—ELECTRIC CLOCK.—Elisha Wilson, New York city.
99,387.—COMPOUND FOR BATING AND RAISING HIDES.—G. W. Adler (assignor to himself and George Bochius), Philadelphia, Pa.
99,388.—WAGON-TONGUE SUPPORT.—Isaac Albright, Jr., and J. Y. Bloomingdale, New Salem, N. Y.
99,389.—TOY PROPELLER.—A. M. Allen, New York city.
99,390.—PRUNING KNIFE.—Henry Alter, Lakeport, Cal.
99,391.—WOOD PAVEMENT.—W. W. Ballard, Elmira, N. Y.
99,392.—TOOL FOR TONGUEING AND GROOVING.—Edward F. Bengler (assignor to himself and G. S. Post), Williamsport, Pa.
99,393.—BILLIARD CUSHION.—John Berlien, Chicago, Ill.
99,394.—APPARATUS FOR CENTERING SHANKS OR EYES IN BUTTONS.—W. H. Blake (assignor to himself and C. M. Mitchell, Waterbury, Conn.
99,395.—PRINTING PRESS.—T. W. Bracher, New York city.
99,396.—HYDRANT.—T. C. Bride, Quincy, Ill.
99,397.—HARVESTER RAKE.—Cyrus Buckwalter, Davenport, Iowa.
99,398.—MITER-BOX.—John Bullard, Hyde Park, Vt.
99,399.—FIRE ESCAPE.—Wm. Burditt and G. H. Burditt, Boston, Mass.
99,400.—LOCK SPINDLE FOR SAFES.—A. G. Burton, Rochester, N. Y.
99,401.—PRINTING TELEGRAPH.—E. A. Callahan, Brooklyn, N. Y.
99,402.—MACHINE FOR FORMING SHEET METAL TUBING.—Mortimer M. Camp (assignor to himself, D. Goffe Phipps, and E. I. Foote), New Haven, Conn.
99,403.—SUBMERGED PUMP.—Perrin H. Cardwell, Knoxville, Tenn. Antedated January 27, 1870.
99,404.—APPARATUS FOR BINDING GRAIN.—George W. Chandler, Mason, N. H., assignor to himself, Henry I. Whitney, same place, and Albert A. Whitney, Battle Creek, Mich.
99,405.—CARRIAGE HUB.—John P. Chandler, Wilton, Me. Antedated January 28, 1870.
99,406.—METHOD OF AERIAL TRANSIT.—Robert A. Chesebrough, New York city. Antedated January 24, 1870.
99,407.—OIL CAN.—P. C. Clark, Philadelphia, Pa.
99,408.—APPARATUS FOR ADMINISTERING MEDICATED VAPORS.—J. C. Cook, New Haven, Conn.
99,409.—MACHINE FOR PLANING IRON.—Alfred B. Couch, Worcester, Mass.
99,410.—SOLDERING MACHINE.—E. T. Covell, Brooklyn, N. Y.
99,411.—MACHINE FOR JOINTING BARREL STAVES.—Harry A. Crossley, Cleveland, Ohio, assignor to himself and Ada D. Crossley.
99,412.—WATERPROOF STOCKING.—Frederick Curtis, Boston, Mass.
99,413.—SPRING BOLT AND CLIP.—John Deeble, Plantsville, Conn.
99,414.—ELECTRO-MAGNETIC MACHINE FOR MEDICAL PURPOSES.—Luis Drescher, New York city.
99,415.—FURNACE FOR MELTING AND REFINING IRON AND OTHER METALS.—Adolph Faber Du Faur, New York city.
99,416.—CLASP FOR TRUNKS, ETC.—Theodore R. Dunham, Newark, N. J.
99,417.—MILK BOX.—C. W. Eastwood, New York city.
99,418.—ADJUSTMENT OF WHEELS ON THE AXLES OF RAILWAY CARS.—Richard Eaton, Eaton Lodge, England.
99,419.—COOKING STOVE.—George M. Eckert, St. Louis, Mo.
99,420.—HANDLE FOR CHILDREN'S CARRIAGES.—R. G. Elder, New York city.
99,421.—FOUR-WHEEL PROPELLER.—R. G. Elder, New York city.
99,422.—JOURNAL BOX.—Seth C. Ellis, Jersey City, N. J.
99,423.—VALVE OF ROTARY ENGINE.—Walter Fitzgerald, Boston, Mass.
99,424.—RAILWAY CAR BRAKE.—Wm. G. Foster, Apalachin, N. Y.
99,425.—CIRCULAR KNITTING MACHINE.—William Franz and William Pope, Crestline, Ohio.
99,426.—CIRCULAR KNITTING MACHINE.—William Franz and William Pope, Crestline, Ohio.
99,427.—MANUFACTURE OF FLOUR.—William Freudenau, St. Louis, Mo.
99,428.—ATTACHING THE MAIN SPRING OF WATCHES.—Charles D. P. Gibson, Boston, Mass.
99,429.—VENTILATOR.—Robert A. Goodyear, Binghamton, N. Y.
99,430.—SPRING MOTOR.—Richard Grimm, New York city.
99,431.—LEATHER SAMMIER.—D. C. Guttridge (assignor to himself and R. A. Dunn), Pittsburgh, Pa.
99,432.—SHEATHING BOARD FOR BUILDINGS.—W. E. Hale, Chicago, Ill. Antedated August 1, 1869.
99,433.—ELEVATOR.—Melancthon Hanford, Boston, Mass.
99,434.—FLY NET FOR HORSES.—Jacob M. Harman, Orangeville, Pa.
99,435.—SUPPORTING COLUMN FOR ELEVATED RAILWAYS.—Charles T. Harvey, Tarrytown, N. Y.
99,436.—COOKING STOVE.—Levi Hermance, Lansingburg, N. Y.
99,437.—CHAMBER PAIL.—George A. Higgins, New York city.
99,438.—COFFEEPOT.—George Hotte, New York city.
99,439.—HARVESTER GEARING FOR CHANGING SPEED.—Moses G. Hubbard, Syracuse, N. Y.
99,440.—SCHOOL DESK.—A. J. Hull (assignor to Novelty Iron Works Manufacturing Company), Sterling, Ill.
99,441.—CHAIR BOTTOM.—Platt C. Ingersoll, Green Point, N. Y.
99,442.—LANTERN.—John H. Irwin, Philadelphia, Pa.
99,443.—LAMP BURNER.—John H. Irwin, Philadelphia, Pa.
99,444.—HARVESTER DROPPER.—Cyreneus D. Jeffries, Wooster, Ohio.
99,445.—ROCKING CHAIR.—Olaus Jensen, Christiain, Norway, Antedated January 24, 1870.
99,446.—DOVETAILING MACHINE.—Dedrick Jordan, Charlestown, Mass., assignor to A. S. & J. Gear & Co., New Haven, Conn.
99,447.—SADDLE TREE.—Israel Landis, St. Joseph, Mo.
99,448.—SPRING HOLDER FOR WAGON SEATS.—James A. Le Forgee, Decatur, Ill.
99,449.—HAY FORK.—James E. Lobdell and Leroy H. Smith, Center Lisle, N. Y.
99,450.—WASHING MACHINE.—Peter Lockie, Rochester, N. Y.
99,451.—HARVESTER.—Wm. R. Low and Augustus Adams, Sandwich, Ill.
99,452.—FERTILIZER, OR FISH GUANO.—Orazio Lugo, Baltimore, Md.
99,453.—HINGE FOR SHOW CASES.—John McAdams, Brooklyn, N. Y.
99,454.—COMBINED FAUCET, MEASURE, AND FUNNEL.—Thos. McMahon, Williamsburgh, N. Y.
99,455.—EXTENSION BEDSTEAD.—Frederick Menzer, San Francisco, Cal.
99,456.—METALLURGIC FURNACE.—James Montgomery, Sing Sing, N. Y.
99,457.—HORSE HAY RAKE.—John Morgan and Wm. Cline, Jun., Clayton, Ind. Antedated January 24, 1870.
99,458.—HAT-SHAPING MACHINE.—Jean Prosper Marlot, Paris, France.
99,459.—STOVEPIPE JOINT.—H. B. Morrison, Le Roy, N. Y.
99,460.—DEVICE FOR HOLDING TOGETHER THE DIFFERENT PARTS OF BUREAUS AND OTHER ARTICLES OF FURNITURE.—D. A. Mullane and J. O. L. Murray, New Orleans, La.
99,461.—LIGHTNING ROD.—David Munson, Indianapolis, Ind. Antedated Jan. 26, 1870.
99,462.—PHOTOGRAPHIC PRINTING FRAME.—Peter Murphy (assignor to E. and H. T. Anthony & Co.), New York city.
99,463.—CORN HARVESTER.—William Murray, Alexandria, Va.
99,464.—MEDICAL COMPOUND FOR CURE OF DROPSY.—Jasper Newton and Ira Barfield, Richland parish, La.
99,465.—THILL COUPLING.—Fred Norris, Freedom Plains, N. Y.
99,466.—BOOT AND SHOE SHAVE.—Sumner Packard, Grafton, Mass.
99,467.—TOOTH FOR GRAIN DRILLS.—Chas. E. Patric, Macedon, N. Y.
99,468.—MANUFACTURE OF SOAP.—H. A. Pease, Hartford, Conn. Antedated Jan. 21, 1870.
99,469.—GRAIN FAN.—Isaac Pennington, Tiffin, Ohio.
99,470.—COMPOUND TOOL.—A. S. Perham (assignor to himself, Alonzo Bell, and Amos Hadley), Washington, D. C.
99,471.—RAILWAY CATTLE CAR.—Charles F. Pike, Providence, R. I., assignor to Henry C. Mahurin and Charles Smead, Boston, Mass.
99,472.—SELF-FEEDING WOOD AND COAL COOKING STOVE.—J. F. Pond, Cleveland, Ohio.
99,473.—SPRING-HEADED SCREW BOLT.—D. R. Pratt, New York city.
99,474.—OILCLOTH CUTTER.—Jonas Rauch, Selin's Grove, Pa.
99,475.—RAILWAY CAR SPRING.—F. W. Rhinelander, New York city.
99,476.—CLAMP FOR FORMING HORSESHOE CALKS.—Jeremiah Rhoads, Niles, Mich.
99,477.—FLOORING SET.—T. M. Richardson, Stockton, Me.
99,478.—SHOULDER BRACE.—S. S. Ritter, Philadelphia, Pa.
99,479.—DECORATIVE SLAB FORMED FROM PLASTIC MATERIALS.—Edwin Robbins, Somers Town, England. Patented in England, Jan. 6, 1869.
99,480.—KNIFE-CLEANING MACHINE.—Thomas Roberts, Lynn, Mass. Antedated Jan. 24, 1870.
99,481.—SEWING MACHINE FOR MAKING GLOVES.—Bruno Rudolph, Berlin, Prussia.
99,482.—LAMP.—J. F. Russell, Washington, D. C.
99,483.—WAGON JACK.—P. B. Russell, Malone, N. Y.
99,484.—HASP FOR TRUNK LOCKS.—A. V. Ryder, New York city.
99,485.—METHOD OF PROTECTING THE ENDS OF VULCANIZED INDIA-RUBBER OR COMBINATION HOSE.—Junius Schenck, Brooklyn, N. Y.
99,486.—HEAD BLOCK FOR SAW MILLS.—G. Selden and O. C. Briggs, Erie, Pa., assignors to Geo. Selden.
99,487.—COMPOUND FOR COLORING AND PRESERVING THE HAIR.—Gibson Smith, Groton Junction, Mass.
99,488.—DRYER.—M. P. Smith, Baltimore, Md.
99,489.—STOVEPIPE SHELF.—Job Smythe, Willing, and C. Dexter, Independence, N. Y.
99,490.—COMBINED HEDGE TRIMMER AND STALK CUTTER.—J. G. Sprague, Lexington, Ill.
99,491.—PARLOR COOK STOVE.—David L. Stiles, Rochester, N. Y.
99,492.—SCAFFOLD.—Henry Swineford, Mifflinburg, Pa.
99,493.—TUNNELING RIVERS.—William Sykes, Sheffield, England.
99,494.—TWINE CUTTER.—George C. Taft, Worcester, Mass. Antedated Jan. 21, 1870.
99,495.—MACHINE FOR DRILLING METALS.—G. C. Taft (assignor to T. H. Dodge), Worcester, Mass.
99,496.—DYE FOR COLORING WOOL.—G. W. Talbot, Providence, R. I.
99,497.—PAINT FOR SHIPS' BOTTOMS.—T. D. Teal, Philadelphia, Pa. Antedated Jan. 24, 1870.
99,498.—SEED SOWER.—J. H. Thomas, Springfield, Ohio.
99,499.—COTTON PLANTER.—T. T. Thorne and G. T. Thorne, Whitaker's Station, N. C.
99,500.—MANUFACTURE OF OILS FROM PETROLEUM.—Charles Toppan, Wakefield, Mass.
99,501.—CORN HARVESTER.—J. H. L. Tuck, Ottawa, Ill.
99,502.—MILK TEMPERING AND COOLING APPARATUS.—I. B. Tuttle, Conewango, N. Y.
99,503.—DRAWING FRAME FOR FLAX, HEMP, ETC.—C. Wall, New York, and John Stewart, Brooklyn, N. Y.
99,504.—BREECH-LOADING FIRE-ARM.—W. G. Ward, Edgewater, N. Y.
99,505.—REVOLVING FIRE-ARM.—Rollin White, Lowell, Mass.
99,506.—RAKE FOR HARVESTERS.—W. N. Whiteley, Springfield, Ohio.
99,507.—SHINGLE MACHINE.—Dunham Wilkes, Nineveh, Ind.
99,508.—SWIVEL SHACKLE.—W. Williams (assignor to himself and D. Harrington), Vallejo, Cal.
99,509.—CAR BRAKE AND STARTER.—J. W. Wilson, New York city.
99,510.—PADDLE WHEEL.—Adam Wingard, San Francisco, Cal.
99,511.—SELF-ACTING MULES FOR SPINNING.—Ed. Wright, Worcester, Mass.
99,512.—BROOM FOR STABLES, ETC.—Thomas Wright (assignor to J. A. Holmes), New York city.
99,513.—STONE-CUTTING MACHINE.—Hugh Young, Middletown, Conn., and J. L. Young, New York city.
99,514.—TOOL FOR CUTTING STONE, ETC.—Hugh Young, Middletown, Conn., and J. L. Young, New York city.
99,515.—RAILWAY BRAKE SHOE.—E. H. Zitzman (assignor to A. A. Freeman), Philadelphia, Pa.
99,516.—MOLDBOARD FOR PLOWS.—F. E. Sessions and S. A. Knox, Worcester, Mass.
99,517.—BOOTJACK.—Chas. Brown, Charlottesville, Va.
98,163.—ROLLER FOR FLUTING MACHINES.—H. G. Pearson, New York city. Patented Dec. 21, 1869.

REISSUES.

3,813.—VARNISH.—D. R. Averill, New Centreville, N. Y. Division A.
3,814.—MANUFACTURE OF VARNISH.—D. R. Averill, New Centreville, N. Y. Division B.
3,815.—COOKING STOVE.—Esek Bussey and C. A. McLeod, Troy, N. Y., assignees of Esek Bussey.
3,816.—TREATMENT OF LEATHER.—N. C. Russell, Gloversville, N. Y.
3,317.—REFLECTOR FOR LAMPS.—W. G. Schmidlin and J. W. Driscoll, New York city.
3,818.—NEEDLE FOR SEWING MACHINES.—H. G. Suplee, San Francisco, Cal. Division A.
3,819.—NEEDLE FOR SEWING MACHINES.—H. G. Suplee, San Francisco, Cal. Division B.
3,820.—PRINTING TELEGRAPH.—The Gold and Stock Telegraph Company, New York city, assignees by mesne assignments, of T. A. Edison.

DESIGNS.

3,827.—STOOL PAN AND ITS COVER.—John Clarke, Boston, Mass.
3,828.—ORNAMENTING GLASSWARE.—J. H. Hobbs, Wheeling, W. Va.
3,829.—ORNAMENTING GLASSWARE.—William Leighton, Jr., Wheeling, W. Va.
3,830 to 3,832.—CARPET PATTERN.—Charles T. Meyer, Newark, N. J., assignor to Edward C. Sampson, New York city. Three Patents.
3,833.—SASH OR SHUTTER LIFT.—Emery Parker (assignor to The Russell & Erwin Manufacturing Company), New Britain, Conn.
3,834.—STEM FOR GLASSWARE.—Daniel C. Ripley, Birmingham, Pa.
3,835.—MEDAL OF ELIAS HOWE, JR.—Allen B. Stockwell, New York city, sole surviving administrator of the estate of Elias Howe, Jr., deceased.
3,836.—BOTTLE.—L. J. Wicks, Bridgeton, N. J., assignor to himself, Wm. Selser, C. N. Selser, J. A. Selser, G. W. Turner, and J. H. Poole.

Inventions Patented in England by Americans.

[Compiled from the "Journal of the Commissioners of Patents."]

PROVISIONAL PROTECTION FOR SIX MONTHS.

3,776.—MANUFACTURE OF IRON AND STEEL.—H. Spencer and L. K. Taylor, Philadelphia, Pa. December 30, 1869.

3,780.—ELECTRIC-MAGNETIC ENGINE.—L. Bastet, New York city. Dec. 31, 1869.

8.—HARNESS.—J. B. Crosby, Boston, Mass. Jan 1, 1870.

16.—BALE TIES.—E. S. Lenox, New Brighton, N. Y. January 3, 1870.

17.—ELECTRO-MAGNETS, AND THE APPLICATION THEREOF FOR OBTAINING MOTIVE POWER.—H. M. Paine, Newark, N. J., and M. S. Frost, New York city. January 3, 1870.

43.—SEWING MACHINE.—Hiram Plummer, Brooklyn, N. Y. January 5, 1870.

59.—LAWN-MOWING MACHINE.—Samuel Colt, Hartford, Conn. January 7, 1870.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per line will be charged.

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, $4·00 a year. Advertisements 17c. a line.

See advertisement of Thomas' Lathes in another column.

Manufacturers of Gas Machines address, with circulars, Box 436, Central City, Col.

American Boiler Powder—A safe, sure, and cheap remedy for scale. Send for circular to Am. B. P. Co., P. O., Box 315, Pittsburgh, Pa.

Manufacturers of rock drills for testing mineral land, please send circulars and price lists to Alfred Wilkin, Toledo, Ohio.

Wanted—Horse-power for ginning cotton. Also, cotton presses. Send circulars, with prices, to O. T. Gibbs, Augusta, Ga.

Chas. Wheeler, Mt. Gilead, Ohio, desires to know where he can procure the easiest kind of crutches. He would prefer those that can be folded, so as to be placed under the seat of a car or couch, if such are made.

Freightcars, changeable gage, wanted. W. C. Welles, Glasgow, Ky

For Sale—Portable engine, nearly new, 4-horse power. Address A. C. C., Postoffice, Hackensack, N. J.

Hominy Mill wanted.—Send circular, with prices, to Joseph Kolb, New Richmond, Ohio.

I guarantee my staple machine to make 200 to 400 lbs. gate, door, and lock staples from 3-16 to ¼-in iron in one day. For machines with State rights, address Wesley Malick, Patentee, Erie, Pa.

Peck's patent drop press. Milo Peck & Co., New Haven, Ct.

Anti-friction Horse-powers, for from one to eight horses. This power, as now made, is the easiest of draft for the amount of work done and we recommend it to all who want a strong machine. Prices reduced Send for a circular to R. H. Allen & Co., Postoffice Box 376, New York.

Consumption, Catarrh, Bronchitis, and all diseases of the throat and lungs cured by using Dr. Carpenter's Compound Medicated Inhalations. Send for pamphlet to Dr. Carpenter, Newark, N. J.

Shawl Pin.—Patent for new shawl pin for sale, or license to manufacture. See advertisement on another page.

Carter's Combined Writing and Copying Ink, manufactured in Boston, is an excellent article. It can be had of J. P. Dinsmore, 36 Dey st., this city.

Right for Sale.—Best thing out. Self-governing action and re-action water wheel. Will vent large or small volume of water. Address Wm. E. Hill, Erie, Pa.

80 acres, having a 50-horse water-power in one of the best counties of Iowa, for sale by D. C. Baker, Ottawa, Ill.

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APPLICATIONS FOR EXTENSION OF PATENTS.

EXCAVATING SCOOPS.—John Taggart, of Boston, Mass., has petitioned for an extension of the above patent. Day of hearing May 4, 1870.

SAW MILL DOGS.—George W. Hill, of Olean, N. Y., has applied for an extension of the above patent. Day of hearing April 30, 1870.

BOOT TREES.—Charles T. Eames, of Milford, Mass., has petitioned for the extension of the above patent. Day of hearing May 11, 1870.

ELECTRO-MAGNETIC PRINTING TELEGRAPH.—Henry N. Baker, Binghamton, N. Y., has applied for an extension of the above patent. Day of hearing April 13, 1870.

MODE OF ATTCHING SLEIGH BELLS TO STRAPS.—Abner G. Bevin, of East Hampton, Conn., has petitioned for an extension of the above patent. Day of hearing July 6, 1870.

ODOMETERS AND COUNTING MACHINES.—J. Lloyd Martin, of Baltimore, Md., has applied for an extension of the above patent. Day of hearing June 1, 1870.

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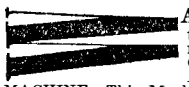

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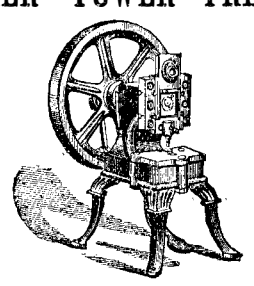

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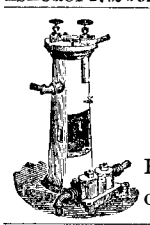

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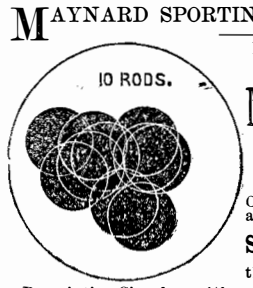

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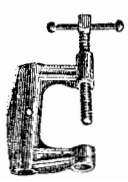

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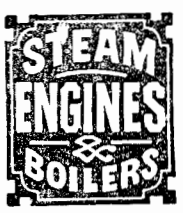

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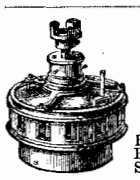

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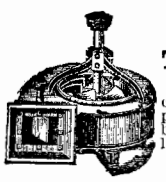

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